

EXHIBIT G

Exhibit A-25
Invalidity Claim Chart for U.S. Patent No. 7,924,802 vs. U.S. Patent No. 8,416,879

U.S. Patent No. 8,416,879 (“Rofougaran”) was filed on March 15, 2006, published on June 7, 2007 (U.S. Patent Application No. 2007/0127590), and issued on April 9, 2013. Rofougaran anticipates asserted claims 1–4, 6–10, 13, 14, 17, and 21–24 of U.S. Patent No. 7,924,802 (“the ‘802 Patent”) under 35 U.S.C. § 102. Rofougaran also renders obvious asserted claims 1–4, 6–10, 13, 14, 17, and 21–24 of the ‘802 Patent under 35 U.S.C. § 103, alone based on the state of the art and/or in combination with one or more other references identified in Exs. A-1–A-31, Cover Pleading, and First Supplemental Ex. A-Obviousness Chart.¹

To the extent Plaintiff alleges that Rofougaran does not disclose any particular limitation of the asserted claims in the ‘802 Patent, either expressly or inherently, it would have been obvious to a person of ordinary skill in the art as of the priority date of the ‘802 Patent to modify Rofougaran and/or to combine the teachings of Rofougaran with other prior art references, including but not limited to the present prior art references found in Exs. A-1–A-31, Cover Pleading, First Supplemental Ex. A-Obviousness Chart, and the relevant section of charts for other prior art for the ‘802 Patent in a manner that would render the asserted claims of these patents invalid as obvious.

With respect to the obviousness of the asserted claims of the ‘802 Patent under 35 U.S.C. § 103, one or more of the principles enumerated by the United States Supreme Court in *KSR v. Teleflex*, 550 U.S. 398 (2007) apply, including: (a) combining various claimed elements known in the prior art according to known methods to yield a predictable result; and/or (b) making a simple substitution of one or more known elements for another to obtain a predictable result; and/or (c) using a known technique to improve a similar device or method in the same way; and/or (d) applying a known technique to a known device or method ready for improvement to yield a predictable result; and/or (e) choosing from a finite number of identified, predictable solutions with a reasonable expectation of success or, in other words, the solution was one which was “obvious to try”; and/or (f) a known work in one field of endeavor prompting variations of it for use either in the same field or a different field based on given design incentives or other market forces in which the variations were predictable to one of ordinary skill in the art; and/or (g) a teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill in the art to modify the prior art reference or to combine the

¹ Samsung is investigating this prior art and has not yet completed discovery from third parties, who may have relevant information concerning the prior art, and therefore, Samsung reserves the right to supplement this chart after additional discovery is received. To the extent that any of the prior art discloses the same or similar functionality or feature(s) of any of the accused products, Samsung reserves the right to argue that said feature or functionality does not practice any limitation of any of the asserted claims, and to argue, in the alternative, that if said feature or functionality is found to practice any limitation of any of the asserted claims in the ‘802 Patent, then the prior art reference teaches the limitation and that the claim is not patentable.

teachings of various prior art references to arrive at the claimed invention. It therefore would have been obvious to one of ordinary skill in the art to combine the disclosures of these references in accordance with the principles and rationales set forth above.

The citations to portions of any reference in this chart are exemplary only. For example, a citation that refers to or discus ses a figure or figure item should be understood to also incorporate by reference that figure and any additional descriptions of that figure as if set forth fully therein. Samsung reserves the right to rely on the entirety of the references cited in this chart to show that the asserted claims of the '802 Patent are invalid. Citations presented for one claim limitation are expressly incorporated by reference into all other limitations for that claim as well as all limitations of all claims on which that claim depends. Samsung also reserves the right to rely on additional citations or sources of evidence that also may be applicable, or that may become applicable in light of claim construction, changes in Plaintiff's infringement contentions, and/or information obtained during discovery as the case progresses.

Claim 1 of the '802 Patent	Prior Art Reference – Rofougaran
[1.1] A method of transmitting information in a wireless communication channel comprising:	<p>To the extent the preamble is limiting, Rofougaran discloses "A method of transmitting information in a wireless communication channel comprising." See, e.g.:</p> <p>FIG. 1 is a diagram showing a portion of a first non-limiting exemplary communication system 100, in accordance with various aspects of the present invention. The communication system (or device) may comprise characteristics of any of a variety of communication systems/devices (e.g., multimode wireless communication devices). For example and without limitation, the communication system may comprise characteristics of any of a variety of mobile wireless communication devices (e.g., cellular phones, paging devices, portable email devices, etc.). Also for example, the communication system may comprise characteristics of fixed communication systems or devices (e.g., network access points, base stations, satellites, wireless routers, set top boxes, etc.). Further for example, the communication system may comprise characteristics of a variety of electronic devices with wireless communication capability (e.g., televisions, music players, cameras, remote controls, personal digital assistants, handheld computers, gaming devices, etc.). Accordingly, the scope of various aspects of the present invention should not be limited by characteristics of particular communication systems or devices.</p> <p>The following discussion will, at times, refer to various communication modes. A multimode communication device may, for example, be adapted to communicate in a plurality of such</p>

Claim 1 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>communication modes. For the following discussion, a communication mode may generally be considered to coincide with communication utilizing a particular communication protocol or standard. A non-limiting list of exemplary communication protocols includes various cellular communication protocols (e.g., GSM, GPRS, EDGE, CDMA, WCDMA, TDMA, PDC, etc.), various wireless networking protocols or standards, including WLAN, WMAN, WPAN and WWAN (e.g., IEEE 802.11, Bluetooth, IEEE 802.15, UWB, IEEE 802.16, IEEE 802.20, Zigbee, any WiFi protocol, etc.), various television communication standards, etc. The scope of various aspects of the present invention should not be limited by characteristics of particular communication modes or protocols, whether standard or proprietary.</p> <p><i>See, e.g.</i>, Rofougaran at 2:36-3:6.</p> <p>Furthermore, this claim element is obvious in light of Rofougaran itself, when combined with any of the other references as charted for this claim element in Exs. A-1–A-31, First Supplemental Ex. A-Obviousness Chart, and/or when combined with the knowledge of one of ordinary skill in the art. Motivations to combine may come from the knowledge of the person of ordinary skill themselves, or from the known problems and predictable solutions as embodied in these references. Further motivations to combine references and additional details may be found in the Cover Pleading and First Supplemental Ex. A-Obviousness Chart.</p>
[1.2] transmitting first information across a first frequency range using a wireless transmitter, the first frequency range having a first center frequency, a first highest frequency, and a first lowest frequency; and	Rofougaran discloses “transmitting first information across a first frequency range using a wireless transmitter, the first frequency range having a first center frequency, a first highest frequency, and a first lowest frequency.” See, e.g.:

Claim 1 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>The diagram illustrates a signal processing system for spectral placement. It starts with two baseband signals: 'First Baseband Signal' (201) and 'Second Baseband Signal' (202), which are fed into a 'Spectral Placement Module' (210). This module outputs signals 211 and 212, which are positioned at frequencies $-f_s$ and f_s relative to a sampling frequency f_s. These signals are then combined by a 'Signal Combiner' (230). The combined signal is sent to a local oscillator ('LO') 246, which also receives a reference signal 247. The LO generates a local oscillator signal 240. This signal is then processed by a mixer (248) and a power amplifier ('PA') 250, resulting in an output signal 252. The PA also receives a signal 241 from the signal combiner. A feedback path 242 is shown connecting the output of the PA back to the signal combiner. Frequency markers $-f_s$, f_s, $-f_{RF}$, and f_{RF} are indicated along the horizontal axis.</p>

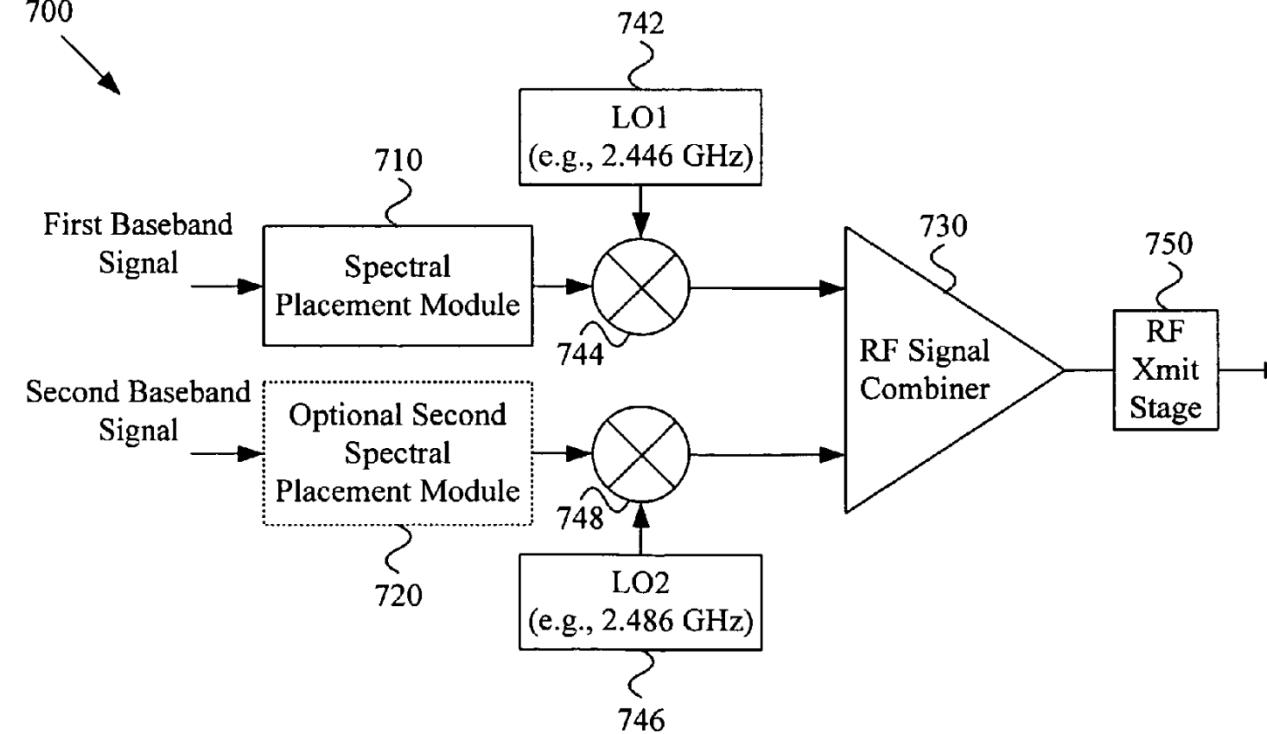
Figure 2

See, e.g., Rofougaran at Figure 2.

Claim 1 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>The diagram illustrates a signal processing chain for RF transmission. It begins with two baseband signals: the 1st Baseband Signal and the 2nd Baseband Signal. These signals are processed by two DACs (Digital-to-Analog Converters), labeled 592 and 594. The outputs of the DACs are fed into a Spectral Placement Module (510) and an optional second spectral placement module (520). The outputs from the Spectral Placement Modules are combined at a Signal Combiner (530). The combined signal then passes through an Upconverter (540) and an RF Xmit Stage (550) before being transmitted.</p>

Figure 5

See, e.g., Rofougaran at Figure 5.

Claim 1 of the '802 Patent	Prior Art Reference – Rofougaran
	 <p>Figure 7</p> <p>See, e.g., Rofougaran at Figure 7.</p> <p>FIG. 1 is a diagram showing a portion of a first non-limiting exemplary communication system 100, in accordance with various aspects of the present invention. The communication system (or device) may comprise characteristics of any of a variety of communication systems/devices (e.g., multimode wireless communication devices). For example and without limitation, the communication system may comprise characteristics of any of a variety of mobile wireless communication devices (e.g.,</p>

Claim 1 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>cellular phones, paging devices, portable email devices, etc.). Also for example, the communication system may comprise characteristics of fixed communication systems or devices (e.g., network access points, base stations, satellites, wireless routers, set top boxes, etc.). Further for example, the communication system may comprise characteristics of a variety of electronic devices with wireless communication capability (e.g., televisions, music players, cameras, remote controls, personal digital assistants, handheld computers, gaming devices, etc.). Accordingly, the scope of various aspects of the present invention should not be limited by characteristics of particular communication systems or devices.</p> <p>The following discussion will, at times, refer to various communication modes. A multimode communication device may, for example, be adapted to communicate in a plurality of such communication modes. For the following discussion, a communication mode may generally be considered to coincide with communication utilizing a particular communication protocol or standard. A non-limiting list of exemplary communication protocols includes various cellular communication protocols (e.g., GSM, GPRS, EDGE, CDMA, WCDMA, TDMA, PDC, etc.), various wireless networking protocols or standards, including WLAN, WMAN, WPAN and WWAN (e.g., IEEE 802.11, Bluetooth, IEEE 802.15, UWB, IEEE 802.16, IEEE 802.20, Zigbee, any WiFi protocol, etc.), various television communication standards, etc. The scope of various aspects of the present invention should not be limited by characteristics of particular communication modes or protocols, whether standard or proprietary.</p> <p>The exemplary communication system 100 may comprise at least a first input 101 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to any of the previously mentioned communication protocols.</p> <p>The exemplary communication system 100 may also comprise at least a second input 102 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first</p>

Claim 1 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>communication protocol discussed above). For example and without limitation, the second baseband signal may correspond to any of the previously mentioned communication protocols. The first baseband signal and the second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of the communication system 100. For example, such modules may generate the first and second baseband signals independently (e.g., corresponding to independent respective communications). Alternatively, for example, such modules may generate the first and second baseband signals in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first and second baseband signals for a single communication).</p> <p>The exemplary communication system 100 may additionally comprise a spectral placement module 110 that is adapted to spectrally shift the first baseband signal (i.e., shift the frequency spectrum of the first baseband signal). In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to spectrally shift the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with the second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to implement a frequency-hopping scheme with the first baseband signal. For example, in a scenario, where there are one or more frequency bands (e.g., a second frequency space) associated with the second baseband signal, the spectral placement module 110 may be adapted to shift the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p><i>See, e.g., Rofougaran at 2:38-3:58.</i></p> <p>The exemplary communication system 100 may also comprise a second spectral placement module 120. Such a second spectral placement module 120 may, for example, share any or all characteristics</p>

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	<p>with the spectral placement module 110 discussed previously. The incorporation of such a second spectral placement module 120 may, for example, provide spectral shifting flexibility. For example, in such an exemplary configuration, either or both of the first and second baseband signals may be spectrally shifted to substantially distinct frequency spaces. Also for example, in such an exemplary configuration, either or both of the first and second baseband signals may be frequency hopped. Note that though the second spectral placement module 120 is illustrated separate from the first spectral placement module 110, the second spectral placement module 120 may share any or all hardware and/or software components with the spectral placement module 110.</p> <p>The exemplary communication system 100 may further comprise a signal combiner 130 that is adapted to generate a composite signal comprising various input signals to the signal combiner 130. For example, the composite signal may simultaneously (i.e., at an instant in time) comprise components associated with various input signals. Note that such simultaneity need not always be present. For example, at a first instant in time, the signal output from the signal combiner 130 might comprise a plurality of components associated with a plurality of respective input signals, at a second instant in time, the signal output from the signal combiner 130 might comprise a single component associated with a single respective input signal, and at a third instant in time, the signal output from the signal combiner 130 might comprise no components.</p> <p>In a first non-limiting exemplary scenario, the signal combiner 130 may receive a first signal that is based on the first baseband signal (e.g., associated with a first communication protocol). Also, the signal combiner 130 may receive a second signal that is based on the second baseband signal (e.g., associated with a second communication protocol). In such a scenario, the signal combiner 130 may combine the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the first baseband signal and a second signal component based on the second baseband signal. In such a scenario, for example where the frequency spectra of the first and second baseband signals do not overlap, the first and second baseband signals might not be spectrally shifted prior to combining by the signal combiner 130. In such a scenario, the spectral placement module 110 (and optionally, the second spectral placement module 120) may receive a control signal indicating whether or not to perform spectral shifting and/or to what degree spectral shifting should be implemented.</p>

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	<p><i>See, e.g.</i>, Rofougaran at 4:16-67.</p> <p>Various components of the exemplary communication system 100 (and other communication systems illustrated and discussed herein) may be implemented in analog and/or digital circuitry. To illustrate this, the exemplary communication system 100 is not shown with analog-to-digital converters (ADCs) or digital-to-analog converters (DACs). FIGS. 4-6, to be discussed later, show various non-limiting exemplary configurations including such converters.</p> <p>FIG. 2 is a diagram showing a portion of a second non-limiting exemplary communication system 200, in accordance with various aspects of the present invention. The communication system 200 may, for example and without limitation, share any or all characteristics with the communication system 100 illustrated in FIG. 1 and discussed previously.</p> <p>The exemplary communication system 200 may comprise at least a first input 201 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to the Bluetooth communication protocol. FIG. 2 shows an exemplary frequency spectrum 203 associated with the first baseband signal.</p> <p>The exemplary communication system 200 may also comprise at least a second input 202 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first communication protocol discussed above). For example and without limitation, the first baseband signal may correspond to an IEEE 802.11 communication protocol (e.g., IEEE 802.11(b) or IEEE 802.11(g)). FIG. 2 shows an exemplary frequency spectrum 204 associated with the second baseband signal.</p> <p><i>See, e.g.</i>, Rofougaran at 5:64-6:31.</p>

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	<p>In a non-limiting exemplary configuration illustrated in FIG. 2, the signal combiner 230 receives a first signal from the spectral placement module 210 that is based on the spectrally shifted first baseband signal. Also, the signal combiner 230 receives a second signal that is based on the second baseband signal. In such a configuration, the signal combiner 230 combines the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the spectrally shifted first baseband signal and a second signal component based on the second baseband signal (e.g., not spectrally shifted).</p> <p>FIG. 2 shows an exemplary frequency spectrum 231 associated with the composite signal formed by the signal combiner 230. The spectrum 231 comprises a first portion 233 corresponding to the first signal component, and a second portion 232 corresponding to the second signal component. Note that the first portion 233 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 232.</p> <p>The exemplary communication system 200 may also comprise an upconverter 240 adapted to upconvert a signal (e.g., the composite signal from the signal combiner 230) for transmission. The upconverter 240 may, for example and without limitation, share any or all characteristics with the upconverter 140 discussed previously.</p> <p>The upconverter 240 may, for example, comprise a mixer 247, a local oscillator 246 and one or more filters 248. The mixer 247 may, for example, receive the composite signal from the signal combiner 230 and an RF mixing signal at frequency fRF from a local oscillator 246. The upconverter 240 may, for example, filter the upconverted signal from the mixer 247 with one or more filters 248. The output of the upconverter 240 may, for example, comprise a signal indicative of the composite signal spectrally shifted to an RF frequency.</p> <p>FIG. 2 shows an exemplary frequency spectrum 241 associated with the RF signal formed by the upconverter 240. The frequency spectrum 241 comprises a first portion 243 corresponding to the first signal component and a second portion 242 corresponding to the second signal component. Note that the first portion 243 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 242. Also note that the first portion 243 and</p>

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	<p>second portion 242 might be formed with a first mirror portion 244 and second mirror portion 245, respectively. Note that a mirror portion may either be removed or may be kept for later processing. The exemplary communication system 200 may further comprise a RF transmission stage 250 adapted to transmit an RF signal. The RF transmission stage 250 may, for example and without limitation, share any or all characteristics with the RF transmission stage 150 discussed previously. Such an RF signal may, for example, be associated with the composite signal output from the signal combiner 230 and upconverted by the upconverter 240. The RF transmission stage 250 may, for example and without limitation, comprise a power amplifier 252, antenna 254 and other components generally associated with RF signal transmission.</p> <p><i>See, e.g., Rofougaran at 6:66-7:57.</i></p> <p>For example, the spectral placement module 510, optional second spectral placement module 520 and signal combiner 530 may operate in the analog domain. The first digital-to-analog converter 592 may convert the first baseband signal to the analog domain for processing by the spectral placement module 510. The second digital-to-analog converter 594 may convert the second baseband signal to the analog domain for processing by the second spectral placement module 520 or signal combiner 530. The signal combiner 530 then combines signals in the analog domain to generate an analog composite signal, which is then upconverted and transmitted by the upconverter 540 and RF transmission stage 550, respectively.</p> <p><i>See, e.g., Rofougaran at 9:30-41.</i></p> <p>FIG. 7 is a diagram showing a portion of a seventh non-limiting exemplary communication system 700, in accordance with various aspects of the present invention. The exemplary communication system 700 may, for example and without limitation, share any or all characteristics with the exemplary systems 100-600 illustrated in FIGS. 1-6 and discussed previously.</p> <p>The exemplary communication system 700 may comprise a first mixer 744 that receives a spectrally shifted first baseband signal from the spectral placement module 710 and a first RF mixing signal (e.g., a 2.446 GHz signal generally associated with the Bluetooth communication protocol) from a</p>

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	<p>first local oscillator 742. The exemplary communication system 700 may also comprise a second mixer 748 that receives a second baseband signal (or a spectrally shifted second baseband signal) and a second RF mixing signal (e.g., a 2.486 GHz signal generally associated with the IEEE 802.11(g) communication protocol) from a second local oscillator 746.</p> <p>The exemplary communication system 700 may comprise an RF signal combiner 730 that is adapted to combine input RF signals. The RF signal combiner 730 may, for example, receive and combine the output signals from the first mixer 744 and second mixer 748 to generate an RF composite signal. The exemplary communication system 700 may also comprise a RF transmission stage 750 that receives the RF composite signal from the RF signal combiner 730 and transmit the signal.</p> <p><i>See, e.g.</i>, Rofougaran at 10:18-43.</p> <p>The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 810 comprises receiving the first baseband signal, step 810 may comprise receiving the first baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The first baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 810 may, for example, comprise generating the first baseband signal independently (e.g., corresponding to an independent communication). Step 810 may alternatively, for example, comprise generating the first baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first baseband signal and other baseband signals for a single communication).</p> <p>The exemplary method 800 may, at step 820, comprise spectrally placing (or shifting) the first baseband signal (e.g., received at step 810). Step 820 may, for example and without limitation, share any or all functional characteristics with the spectral placement modules 110-710 of the exemplary systems 100-700 illustrated in FIGS. 1-7 and discussed previously.</p>

Claim 1 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>Step 820 may, for example, comprise spectrally shifting the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with a second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, step 820 may comprise implementing a frequency-hopping scheme with the first baseband signal. For example, in a scenario where there are one or more frequency bands (e.g., a second frequency space) associated with a second baseband signal, step 820 may comprise spectrally shifting the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p>In another non-limiting exemplary scenario, spectrally shifting the first baseband signal may result in the production of a spectral image (e.g., frequency content mirrored about a mixing frequency utilized to spectrally shift the first baseband signal). In such a scenario, step 820 may comprise accepting or rejecting the image.</p> <p>In a scenario where an image is rejected, step 820 may comprise rejecting the image in any of a variety of manners. For example and without limitation, step 820 may comprise performing image reject mixing to spectrally shift the first baseband signal. Such image reject mixing generally comprises spectrally shifting a signal and rejecting an image associated with the spectrally shifted signal. Also for example, step 820 may comprise filtering out an unwanted image. The scope of various aspects of the present invention should not be limited by the utilization of image rejection or by any particular manner of performing such image rejection.</p> <p>The exemplary method 800 may, at step 830, comprise generating and/or receiving a second baseband signal corresponding to a second communication protocol (e.g., different from the first communication protocol). Step 830 may, for example and without limitation, share any or all functional characteristics with the second input 102 of the exemplary system 100 illustrated in FIG. 1 and discussed previously.</p>

Claim 1 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>The second baseband signal may, for example, correspond to a second communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 830 comprises receiving the second baseband signal, step 830 may comprise receiving the second baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 830 may, for example, comprise generating the second baseband signal independently (e.g., corresponding to a communication independent of a communication associated with the first baseband signal). Step 830 may alternatively, for example, comprise generating the second baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the second baseband signal and the first baseband signal for a single communication).</p> <p><i>See, e.g., Rofougaran at 11:53-13:4.</i></p> <p>Furthermore, this claim element is obvious in light of Rofougaran itself, when combined with any of the other references as charted for this claim element in Exs. A-1–A-31, First Supplemental Ex. A-Obviousness Chart, and/or when combined with the knowledge of one of ordinary skill in the art. Motivations to combine may come from the knowledge of the person of ordinary skill themselves, or from the known problems and predictable solutions as embodied in these references. Further motivations to combine references and additional details may be found in the Cover Pleading and First Supplemental Ex. A-Obviousness Chart.</p>
[1.3] simultaneously transmitting second information across a second frequency range using the same wireless transmitter, the second frequency range having a second center frequency greater than the	Rofougaran discloses “simultaneously transmitting second information across a second frequency range using the same wireless transmitter, the second frequency range having a second center frequency greater than the first center frequency, a second highest frequency, and a second lowest frequency.” See, e.g.:

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<p>first center frequency, a second highest frequency, and a second lowest frequency.</p>	<p>The diagram illustrates a signal processing system for spectral placement. It starts with two baseband signals: a 'First Baseband Signal' (201) and a 'Second Baseband Signal' (202). These signals are processed by a 'Spectral Placement Module' (210), which generates three intermediate signals: 211 (at frequency f_s), 212 (at frequency f_s), and 213 (at frequency $-f_s$). These intermediate signals are combined at a 'Signal Combiner' (230). The output of the combiner is fed into a local oscillator ('LO') 246, which also receives a reference signal from a reference source (248). The LO generates a local oscillator signal (247). This signal is mixed with the combined intermediate signals at a mixer (245) to produce an RF signal (241). The RF signal is then amplified by a power amplifier ('PA') 250 and transmitted through an antenna (252). Frequency markers on the spectrum include f_s (center), $-f_s$ (second lowest), and f_{RF} (second highest).</p>

Figure 2

See, e.g., Rofougaran at Figure 2.

Claim 1 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>The diagram illustrates a signal processing chain for a transceiver. It begins with two baseband signal inputs: the 1st Baseband Signal and the 2nd Baseband Signal. These signals are processed by two DACs (Digital-to-Analog Converters), labeled 592 and 594. The outputs of the DACs are fed into a Spectral Placement Module (510) and an optional second spectral placement module (520). The outputs from the modules are combined at a Signal Combiner (530). The combined signal then passes through an Upconverter (540) and an RF Xmit Stage (550) before being transmitted.</p>

Figure 5

See, e.g., Rofougaran at Figure 5.

Claim 1 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>The diagram illustrates a communication system architecture. It begins with two input paths: 'First Baseband Signal' entering a 'Spectral Placement Module' (710) and 'Second Baseband Signal' entering an 'Optional Second Spectral Placement Module' (720). The 'Spectral Placement Module' (710) is connected to a local oscillator 'LO1' (e.g., 2.446 GHz) via a mixer (744). The 'Optional Second Spectral Placement Module' (720) is connected to a local oscillator 'LO2' (e.g., 2.486 GHz) via a mixer (748). The outputs from the mixers (744 and 748) are combined at an 'RF Signal Combiner' (730). The output of the RF Signal Combiner (730) is processed by an 'RF Xmit Stage' (750) before being transmitted.</p>

Figure 7

See, e.g., Rofougaran at Figure 7.

FIG. 1 is a diagram showing a portion of a first non-limiting exemplary communication system 100, in accordance with various aspects of the present invention. The communication system (or device) may comprise characteristics of any of a variety of communication systems/devices (e.g., multimode wireless communication devices). For example and without limitation, the communication system may comprise characteristics of any of a variety of mobile wireless communication devices (e.g.,

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	<p>cellular phones, paging devices, portable email devices, etc.). Also for example, the communication system may comprise characteristics of fixed communication systems or devices (e.g., network access points, base stations, satellites, wireless routers, set top boxes, etc.). Further for example, the communication system may comprise characteristics of a variety of electronic devices with wireless communication capability (e.g., televisions, music players, cameras, remote controls, personal digital assistants, handheld computers, gaming devices, etc.). Accordingly, the scope of various aspects of the present invention should not be limited by characteristics of particular communication systems or devices.</p> <p>The following discussion will, at times, refer to various communication modes. A multimode communication device may, for example, be adapted to communicate in a plurality of such communication modes. For the following discussion, a communication mode may generally be considered to coincide with communication utilizing a particular communication protocol or standard. A non-limiting list of exemplary communication protocols includes various cellular communication protocols (e.g., GSM, GPRS, EDGE, CDMA, WCDMA, TDMA, PDC, etc.), various wireless networking protocols or standards, including WLAN, WMAN, WPAN and WWAN (e.g., IEEE 802.11, Bluetooth, IEEE 802.15, UWB, IEEE 802.16, IEEE 802.20, Zigbee, any WiFi protocol, etc.), various television communication standards, etc. The scope of various aspects of the present invention should not be limited by characteristics of particular communication modes or protocols, whether standard or proprietary.</p> <p>The exemplary communication system 100 may comprise at least a first input 101 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to any of the previously mentioned communication protocols.</p> <p>The exemplary communication system 100 may also comprise at least a second input 102 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first</p>

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	<p>communication protocol discussed above). For example and without limitation, the second baseband signal may correspond to any of the previously mentioned communication protocols. The first baseband signal and the second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of the communication system 100. For example, such modules may generate the first and second baseband signals independently (e.g., corresponding to independent respective communications). Alternatively, for example, such modules may generate the first and second baseband signals in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first and second baseband signals for a single communication).</p> <p>The exemplary communication system 100 may additionally comprise a spectral placement module 110 that is adapted to spectrally shift the first baseband signal (i.e., shift the frequency spectrum of the first baseband signal). In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to spectrally shift the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with the second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to implement a frequency-hopping scheme with the first baseband signal. For example, in a scenario, where there are one or more frequency bands (e.g., a second frequency space) associated with the second baseband signal, the spectral placement module 110 may be adapted to shift the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p><i>See, e.g., Rofougaran at 2:38-3:58.</i></p> <p>The exemplary communication system 100 may also comprise a second spectral placement module 120. Such a second spectral placement module 120 may, for example, share any or all characteristics</p>

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	<p>with the spectral placement module 110 discussed previously. The incorporation of such a second spectral placement module 120 may, for example, provide spectral shifting flexibility. For example, in such an exemplary configuration, either or both of the first and second baseband signals may be spectrally shifted to substantially distinct frequency spaces. Also for example, in such an exemplary configuration, either or both of the first and second baseband signals may be frequency hopped. Note that though the second spectral placement module 120 is illustrated separate from the first spectral placement module 110, the second spectral placement module 120 may share any or all hardware and/or software components with the spectral placement module 110.</p> <p>The exemplary communication system 100 may further comprise a signal combiner 130 that is adapted to generate a composite signal comprising various input signals to the signal combiner 130. For example, the composite signal may simultaneously (i.e., at an instant in time) comprise components associated with various input signals. Note that such simultaneity need not always be present. For example, at a first instant in time, the signal output from the signal combiner 130 might comprise a plurality of components associated with a plurality of respective input signals, at a second instant in time, the signal output from the signal combiner 130 might comprise a single component associated with a single respective input signal, and at a third instant in time, the signal output from the signal combiner 130 might comprise no components.</p> <p>In a first non-limiting exemplary scenario, the signal combiner 130 may receive a first signal that is based on the first baseband signal (e.g., associated with a first communication protocol). Also, the signal combiner 130 may receive a second signal that is based on the second baseband signal (e.g., associated with a second communication protocol). In such a scenario, the signal combiner 130 may combine the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the first baseband signal and a second signal component based on the second baseband signal. In such a scenario, for example where the frequency spectra of the first and second baseband signals do not overlap, the first and second baseband signals might not be spectrally shifted prior to combining by the signal combiner 130. In such a scenario, the spectral placement module 110 (and optionally, the second spectral placement module 120) may receive a control signal indicating whether or not to perform spectral shifting and/or to what degree spectral shifting should be implemented.</p>

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	<p><i>See, e.g.</i>, Rofougaran at 4:16-67.</p> <p>Various components of the exemplary communication system 100 (and other communication systems illustrated and discussed herein) may be implemented in analog and/or digital circuitry. To illustrate this, the exemplary communication system 100 is not shown with analog-to-digital converters (ADCs) or digital-to-analog converters (DACs). FIGS. 4-6, to be discussed later, show various non-limiting exemplary configurations including such converters.</p> <p>FIG. 2 is a diagram showing a portion of a second non-limiting exemplary communication system 200, in accordance with various aspects of the present invention. The communication system 200 may, for example and without limitation, share any or all characteristics with the communication system 100 illustrated in FIG. 1 and discussed previously.</p> <p>The exemplary communication system 200 may comprise at least a first input 201 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to the Bluetooth communication protocol. FIG. 2 shows an exemplary frequency spectrum 203 associated with the first baseband signal.</p> <p>The exemplary communication system 200 may also comprise at least a second input 202 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first communication protocol discussed above). For example and without limitation, the first baseband signal may correspond to an IEEE 802.11 communication protocol (e.g., IEEE 802.11(b) or IEEE 802.11(g)). FIG. 2 shows an exemplary frequency spectrum 204 associated with the second baseband signal.</p> <p><i>See, e.g.</i>, Rofougaran at 5:64-6:31.</p>

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	<p>In a non-limiting exemplary configuration illustrated in FIG. 2, the signal combiner 230 receives a first signal from the spectral placement module 210 that is based on the spectrally shifted first baseband signal. Also, the signal combiner 230 receives a second signal that is based on the second baseband signal. In such a configuration, the signal combiner 230 combines the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the spectrally shifted first baseband signal and a second signal component based on the second baseband signal (e.g., not spectrally shifted).</p> <p>FIG. 2 shows an exemplary frequency spectrum 231 associated with the composite signal formed by the signal combiner 230. The spectrum 231 comprises a first portion 233 corresponding to the first signal component, and a second portion 232 corresponding to the second signal component. Note that the first portion 233 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 232.</p> <p>The exemplary communication system 200 may also comprise an upconverter 240 adapted to upconvert a signal (e.g., the composite signal from the signal combiner 230) for transmission. The upconverter 240 may, for example and without limitation, share any or all characteristics with the upconverter 140 discussed previously.</p> <p>The upconverter 240 may, for example, comprise a mixer 247, a local oscillator 246 and one or more filters 248. The mixer 247 may, for example, receive the composite signal from the signal combiner 230 and an RF mixing signal at frequency fRF from a local oscillator 246. The upconverter 240 may, for example, filter the upconverted signal from the mixer 247 with one or more filters 248. The output of the upconverter 240 may, for example, comprise a signal indicative of the composite signal spectrally shifted to an RF frequency.</p> <p>FIG. 2 shows an exemplary frequency spectrum 241 associated with the RF signal formed by the upconverter 240. The frequency spectrum 241 comprises a first portion 243 corresponding to the first signal component and a second portion 242 corresponding to the second signal component. Note that the first portion 243 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 242. Also note that the first portion 243 and</p>

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	<p>second portion 242 might be formed with a first mirror portion 244 and second mirror portion 245, respectively. Note that a mirror portion may either be removed or may be kept for later processing. The exemplary communication system 200 may further comprise a RF transmission stage 250 adapted to transmit an RF signal. The RF transmission stage 250 may, for example and without limitation, share any or all characteristics with the RF transmission stage 150 discussed previously. Such an RF signal may, for example, be associated with the composite signal output from the signal combiner 230 and upconverted by the upconverter 240. The RF transmission stage 250 may, for example and without limitation, comprise a power amplifier 252, antenna 254 and other components generally associated with RF signal transmission.</p> <p><i>See, e.g., Rofougaran at 6:66-7:57.</i></p> <p>For example, the spectral placement module 510, optional second spectral placement module 520 and signal combiner 530 may operate in the analog domain. The first digital-to-analog converter 592 may convert the first baseband signal to the analog domain for processing by the spectral placement module 510. The second digital-to-analog converter 594 may convert the second baseband signal to the analog domain for processing by the second spectral placement module 520 or signal combiner 530. The signal combiner 530 then combines signals in the analog domain to generate an analog composite signal, which is then upconverted and transmitted by the upconverter 540 and RF transmission stage 550, respectively.</p> <p><i>See, e.g., Rofougaran at 9:30-41.</i></p> <p>FIG. 7 is a diagram showing a portion of a seventh non-limiting exemplary communication system 700, in accordance with various aspects of the present invention. The exemplary communication system 700 may, for example and without limitation, share any or all characteristics with the exemplary systems 100-600 illustrated in FIGS. 1-6 and discussed previously.</p> <p>The exemplary communication system 700 may comprise a first mixer 744 that receives a spectrally shifted first baseband signal from the spectral placement module 710 and a first RF mixing signal (e.g., a 2.446 GHz signal generally associated with the Bluetooth communication protocol) from a</p>

Claim 1 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>first local oscillator 742. The exemplary communication system 700 may also comprise a second mixer 748 that receives a second baseband signal (or a spectrally shifted second baseband signal) and a second RF mixing signal (e.g., a 2.486 GHz signal generally associated with the IEEE 802.11(g) communication protocol) from a second local oscillator 746.</p> <p>The exemplary communication system 700 may comprise an RF signal combiner 730 that is adapted to combine input RF signals. The RF signal combiner 730 may, for example, receive and combine the output signals from the first mixer 744 and second mixer 748 to generate an RF composite signal. The exemplary communication system 700 may also comprise a RF transmission stage 750 that receives the RF composite signal from the RF signal combiner 730 and transmit the signal.</p> <p><i>See, e.g., Rofougaran at 10:18-43.</i></p> <p>The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 810 comprises receiving the first baseband signal, step 810 may comprise receiving the first baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The first baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 810 may, for example, comprise generating the first baseband signal independently (e.g., corresponding to an independent communication). Step 810 may alternatively, for example, comprise generating the first baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first baseband signal and other baseband signals for a single communication).</p> <p>The exemplary method 800 may, at step 820, comprise spectrally placing (or shifting) the first baseband signal (e.g., received at step 810). Step 820 may, for example and without limitation, share any or all functional characteristics with the spectral placement modules 110-710 of the exemplary systems 100-700 illustrated in FIGS. 1-7 and discussed previously.</p>

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	<p>Step 820 may, for example, comprise spectrally shifting the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with a second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, step 820 may comprise implementing a frequency-hopping scheme with the first baseband signal. For example, in a scenario where there are one or more frequency bands (e.g., a second frequency space) associated with a second baseband signal, step 820 may comprise spectrally shifting the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p>In another non-limiting exemplary scenario, spectrally shifting the first baseband signal may result in the production of a spectral image (e.g., frequency content mirrored about a mixing frequency utilized to spectrally shift the first baseband signal). In such a scenario, step 820 may comprise accepting or rejecting the image.</p> <p>In a scenario where an image is rejected, step 820 may comprise rejecting the image in any of a variety of manners. For example and without limitation, step 820 may comprise performing image reject mixing to spectrally shift the first baseband signal. Such image reject mixing generally comprises spectrally shifting a signal and rejecting an image associated with the spectrally shifted signal. Also for example, step 820 may comprise filtering out an unwanted image. The scope of various aspects of the present invention should not be limited by the utilization of image rejection or by any particular manner of performing such image rejection.</p> <p>The exemplary method 800 may, at step 830, comprise generating and/or receiving a second baseband signal corresponding to a second communication protocol (e.g., different from the first communication protocol). Step 830 may, for example and without limitation, share any or all functional characteristics with the second input 102 of the exemplary system 100 illustrated in FIG. 1 and discussed previously.</p>

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	<p>The second baseband signal may, for example, correspond to a second communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 830 comprises receiving the second baseband signal, step 830 may comprise receiving the second baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 830 may, for example, comprise generating the second baseband signal independently (e.g., corresponding to a communication independent of a communication associated with the first baseband signal). Step 830 may alternatively, for example, comprise generating the second baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the second baseband signal and the first baseband signal for a single communication).</p> <p><i>See, e.g., Rofougaran at 11:53-13:4.</i></p> <p>Furthermore, this claim element is obvious in light of Rofougaran itself, when combined with any of the other references as charted for this claim element in Exs. A-1–A-31, First Supplemental Ex. A–Obviousness Chart, and/or when combined with the knowledge of one of ordinary skill in the art. Motivations to combine may come from the knowledge of the person of ordinary skill themselves, or from the known problems and predictable solutions as embodied in these references. Further motivations to combine references and additional details may be found in the Cover Pleading and First Supplemental Ex. A–Obviousness Chart.</p>

Claim 2 of the '802 Patent	Prior Art Reference – Rofougaran
[2.1] The method of claim 1	Rofougaran discloses all the elements of claim 1 for all the reasons provided above.
[2.2] wherein frequency difference between the first center frequency and the	Rofougaran discloses “wherein frequency difference between the first center frequency and the second center frequency is greater than the sum of one-half the first frequency range and one-half the second frequency range.” See, e.g.:

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<p>second center frequency is greater than the sum of one-half the first frequency range and one-half the second frequency range.</p>	<p>Figure 2</p> <p>See, e.g., Rofougaran at Figure 2.</p> <p>FIG. 1 is a diagram showing a portion of a first non-limiting exemplary communication system 100, in accordance with various aspects of the present invention. The communication system (or device) may comprise characteristics of any of a variety of communication systems/devices (e.g., multimode wireless communication devices). For example and without limitation, the communication system may comprise characteristics of any of a variety of mobile wireless communication devices (e.g., cellular phones, paging devices, portable email devices, etc.). Also for example, the communication system may comprise characteristics of fixed communication systems or devices (e.g., network</p>

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	<p>access points, base stations, satellites, wireless routers, set top boxes, etc.). Further for example, the communication system may comprise characteristics of a variety of electronic devices with wireless communication capability (e.g., televisions, music players, cameras, remote controls, personal digital assistants, handheld computers, gaming devices, etc.). Accordingly, the scope of various aspects of the present invention should not be limited by characteristics of particular communication systems or devices.</p> <p>The following discussion will, at times, refer to various communication modes. A multimode communication device may, for example, be adapted to communicate in a plurality of such communication modes. For the following discussion, a communication mode may generally be considered to coincide with communication utilizing a particular communication protocol or standard. A non-limiting list of exemplary communication protocols includes various cellular communication protocols (e.g., GSM, GPRS, EDGE, CDMA, WCDMA, TDMA, PDC, etc.), various wireless networking protocols or standards, including WLAN, WMAN, WPAN and WWAN (e.g., IEEE 802.11, Bluetooth, IEEE 802.15, UWB, IEEE 802.16, IEEE 802.20, Zigbee, any WiFi protocol, etc.), various television communication standards, etc. The scope of various aspects of the present invention should not be limited by characteristics of particular communication modes or protocols, whether standard or proprietary.</p> <p>The exemplary communication system 100 may comprise at least a first input 101 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to any of the previously mentioned communication protocols.</p> <p>The exemplary communication system 100 may also comprise at least a second input 102 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first communication protocol discussed above). For example and without limitation, the second baseband signal may correspond to any of the previously mentioned communication protocols.</p>

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	<p>The first baseband signal and the second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of the communication system 100. For example, such modules may generate the first and second baseband signals independently (e.g., corresponding to independent respective communications). Alternatively, for example, such modules may generate the first and second baseband signals in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first and second baseband signals for a single communication).</p> <p>The exemplary communication system 100 may additionally comprise a spectral placement module 110 that is adapted to spectrally shift the first baseband signal (i.e., shift the frequency spectrum of the first baseband signal). In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to spectrally shift the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with the second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to implement a frequency-hopping scheme with the first baseband signal. For example, in a scenario, where there are one or more frequency bands (e.g., a second frequency space) associated with the second baseband signal, the spectral placement module 110 may be adapted to shift the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p><i>See, e.g., Rofougaran at 2:38-3:58.</i></p> <p>The exemplary communication system 100 may also comprise a second spectral placement module 120. Such a second spectral placement module 120 may, for example, share any or all characteristics with the spectral placement module 110 discussed previously. The incorporation of such a second spectral placement module 120 may, for example, provide spectral shifting flexibility. For example,</p>

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	<p>in such an exemplary configuration, either or both of the first and second baseband signals may be spectrally shifted to substantially distinct frequency spaces. Also for example, in such an exemplary configuration, either or both of the first and second baseband signals may be frequency hopped. Note that though the second spectral placement module 120 is illustrated separate from the first spectral placement module 110, the second spectral placement module 120 may share any or all hardware and/or software components with the spectral placement module 110.</p> <p>The exemplary communication system 100 may further comprise a signal combiner 130 that is adapted to generate a composite signal comprising various input signals to the signal combiner 130. For example, the composite signal may simultaneously (i.e., at an instant in time) comprise components associated with various input signals. Note that such simultaneity need not always be present. For example, at a first instant in time, the signal output from the signal combiner 130 might comprise a plurality of components associated with a plurality of respective input signals, at a second instant in time, the signal output from the signal combiner 130 might comprise a single component associated with a single respective input signal, and at a third instant in time, the signal output from the signal combiner 130 might comprise no components.</p> <p>In a first non-limiting exemplary scenario, the signal combiner 130 may receive a first signal that is based on the first baseband signal (e.g., associated with a first communication protocol). Also, the signal combiner 130 may receive a second signal that is based on the second baseband signal (e.g., associated with a second communication protocol). In such a scenario, the signal combiner 130 may combine the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the first baseband signal and a second signal component based on the second baseband signal. In such a scenario, for example where the frequency spectra of the first and second baseband signals do not overlap, the first and second baseband signals might not be spectrally shifted prior to combining by the signal combiner 130. In such a scenario, the spectral placement module 110 (and optionally, the second spectral placement module 120) may receive a control signal indicating whether or not to perform spectral shifting and/or to what degree spectral shifting should be implemented.</p> <p><i>See, e.g., Rofougaran at 4:16-67.</i></p>

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	<p>Various components of the exemplary communication system 100 (and other communication systems illustrated and discussed herein) may be implemented in analog and/or digital circuitry. To illustrate this, the exemplary communication system 100 is not shown with analog-to-digital converters (ADCs) or digital-to-analog converters (DACs). FIGS. 4-6, to be discussed later, show various non-limiting exemplary configurations including such converters.</p> <p>FIG. 2 is a diagram showing a portion of a second non-limiting exemplary communication system 200, in accordance with various aspects of the present invention. The communication system 200 may, for example and without limitation, share any or all characteristics with the communication system 100 illustrated in FIG. 1 and discussed previously.</p> <p>The exemplary communication system 200 may comprise at least a first input 201 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to the Bluetooth communication protocol. FIG. 2 shows an exemplary frequency spectrum 203 associated with the first baseband signal.</p> <p>The exemplary communication system 200 may also comprise at least a second input 202 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first communication protocol discussed above). For example and without limitation, the first baseband signal may correspond to an IEEE 802.11 communication protocol (e.g., IEEE 802.11(b) or IEEE 802.11(g)). FIG. 2 shows an exemplary frequency spectrum 204 associated with the second baseband signal.</p> <p><i>See, e.g., Rofougaran at 5:64-6:31.</i></p> <p>In a non-limiting exemplary configuration illustrated in FIG. 2, the signal combiner 230 receives a first signal from the spectral placement module 210 that is based on the spectrally shifted first</p>

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	<p>baseband signal. Also, the signal combiner 230 receives a second signal that is based on the second baseband signal. In such a configuration, the signal combiner 230 combines the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the spectrally shifted first baseband signal and a second signal component based on the second baseband signal (e.g., not spectrally shifted).</p> <p>FIG. 2 shows an exemplary frequency spectrum 231 associated with the composite signal formed by the signal combiner 230. The spectrum 231 comprises a first portion 233 corresponding to the first signal component, and a second portion 232 corresponding to the second signal component. Note that the first portion 233 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 232.</p> <p>The exemplary communication system 200 may also comprise an upconverter 240 adapted to upconvert a signal (e.g., the composite signal from the signal combiner 230) for transmission. The upconverter 240 may, for example and without limitation, share any or all characteristics with the upconverter 140 discussed previously.</p> <p>The upconverter 240 may, for example, comprise a mixer 247, a local oscillator 246 and one or more filters 248. The mixer 247 may, for example, receive the composite signal from the signal combiner 230 and an RF mixing signal at frequency fRF from a local oscillator 246. The upconverter 240 may, for example, filter the upconverted signal from the mixer 247 with one or more filters 248. The output of the upconverter 240 may, for example, comprise a signal indicative of the composite signal spectrally shifted to an RF frequency.</p> <p>FIG. 2 shows an exemplary frequency spectrum 241 associated with the RF signal formed by the upconverter 240. The frequency spectrum 241 comprises a first portion 243 corresponding to the first signal component and a second portion 242 corresponding to the second signal component. Note that the first portion 243 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 242. Also note that the first portion 243 and second portion 242 might be formed with a first mirror portion 244 and second mirror portion 245, respectively. Note that a mirror portion may either be removed or may be kept for later processing.</p>

Claim 2 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>The exemplary communication system 200 may further comprise a RF transmission stage 250 adapted to transmit an RF signal. The RF transmission stage 250 may, for example and without limitation, share any or all characteristics with the RF transmission stage 150 discussed previously. Such an RF signal may, for example, be associated with the composite signal output from the signal combiner 230 and upconverted by the upconverter 240. The RF transmission stage 250 may, for example and without limitation, comprise a power amplifier 252, antenna 254 and other components generally associated with RF signal transmission.</p> <p><i>See, e.g., Rofougaran at 6:66-7:57.</i></p> <p>For example, the spectral placement module 510, optional second spectral placement module 520 and signal combiner 530 may operate in the analog domain. The first digital-to-analog converter 592 may convert the first baseband signal to the analog domain for processing by the spectral placement module 510. The second digital-to-analog converter 594 may convert the second baseband signal to the analog domain for processing by the second spectral placement module 520 or signal combiner 530. The signal combiner 530 then combines signals in the analog domain to generate an analog composite signal, which is then upconverted and transmitted by the upconverter 540 and RF transmission stage 550, respectively.</p> <p><i>See, e.g., Rofougaran at 9:30-41.</i></p> <p>FIG. 7 is a diagram showing a portion of a seventh non-limiting exemplary communication system 700, in accordance with various aspects of the present invention. The exemplary communication system 700 may, for example and without limitation, share any or all characteristics with the exemplary systems 100-600 illustrated in FIGS. 1-6 and discussed previously.</p> <p>The exemplary communication system 700 may comprise a first mixer 744 that receives a spectrally shifted first baseband signal from the spectral placement module 710 and a first RF mixing signal (e.g., a 2.446 GHz signal generally associated with the Bluetooth communication protocol) from a first local oscillator 742. The exemplary communication system 700 may also comprise a second mixer 748 that receives a second baseband signal (or a spectrally shifted second baseband signal) and</p>

Claim 2 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>a second RF mixing signal (e.g., a 2.486 GHz signal generally associated with the IEEE 802.11(g) communication protocol) from a second local oscillator 746.</p> <p>The exemplary communication system 700 may comprise an RF signal combiner 730 that is adapted to combine input RF signals. The RF signal combiner 730 may, for example, receive and combine the output signals from the first mixer 744 and second mixer 748 to generate an RF composite signal. The exemplary communication system 700 may also comprise a RF transmission stage 750 that receives the RF composite signal from the RF signal combiner 730 and transmit the signal.</p> <p><i>See, e.g., Rofougaran at 10:18-43.</i></p> <p>The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 810 comprises receiving the first baseband signal, step 810 may comprise receiving the first baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The first baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 810 may, for example, comprise generating the first baseband signal independently (e.g., corresponding to an independent communication). Step 810 may alternatively, for example, comprise generating the first baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first baseband signal and other baseband signals for a single communication).</p> <p>The exemplary method 800 may, at step 820, comprise spectrally placing (or shifting) the first baseband signal (e.g., received at step 810). Step 820 may, for example and without limitation, share any or all functional characteristics with the spectral placement modules 110-710 of the exemplary systems 100-700 illustrated in FIGS. 1-7 and discussed previously.</p> <p>Step 820 may, for example, comprise spectrally shifting the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially</p>

Claim 2 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>distinct from one or more frequency bands associated with a second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, step 820 may comprise implementing a frequency -hopping scheme with the first baseband signal. For example, in a scenario where there are one or more frequency bands (e.g., a second frequency space) associated with a second baseband signal, step 820 may comprise spectrally shifting the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p>In another non-limiting exemplary scenario, spectrally shifting the first baseband signal may result in the production of a spectral image (e.g., frequency content mirrored about a mixing frequency utilized to spectrally shift the first baseband signal). In such a scenario, step 820 may comprise accepting or rejecting the image.</p> <p>In a scenario where an image is rejected, step 820 may comprise rejecting the image in any of a variety of manners. For example and without limitation, step 820 may comprise performing image reject mixing to spectrally shift the first baseband signal. Such image reject mixing generally comprises spectrally shifting a signal and rejecting an image associated with the spectrally shifted signal. Also for example, step 820 may comprise filtering out an unwanted image. The scope of various aspects of the present invention should not be limited by the utilization of image rejection or by any particular manner of performing such image rejection.</p> <p>The exemplary method 800 may, at step 830, comprise generating and/or receiving a second baseband signal corresponding to a second communication protocol (e.g., different from the first communication protocol). Step 830 may, for example and without limitation, share any or all functional characteristics with the second input 102 of the exemplary system 100 illustrated in FIG. 1 and discussed previously.</p>

Claim 2 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>The second baseband signal may, for example, correspond to a second communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 830 comprises receiving the second baseband signal, step 830 may comprise receiving the second baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 830 may, for example, comprise generating the second baseband signal independently (e.g., corresponding to a communication independent of a communication associated with the first baseband signal). Step 830 may alternatively, for example, comprise generating the second baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the second baseband signal and the first baseband signal for a single communication).</p> <p><i>See, e.g., Rofougaran at 11:53-13:4.</i></p> <p>Furthermore, this claim element is obvious in light of Rofougaran itself, when combined with any of the other references as charted for this claim element in Exs. A-1–A-31, First Supplemental Ex. A-Obviousness Chart, and/or when combined with the knowledge of one of ordinary skill in the art. Motivations to combine may come from the knowledge of the person of ordinary skill themselves, or from the known problems and predictable solutions as embodied in these references. Further motivations to combine references and additional details may be found in the Cover Pleading and First Supplemental Ex. A-Obviousness Chart.</p>

Claim 3 of the '802 Patent	Prior Art Reference – Rofougaran
[3.1] The method of claim 1	Rofougaran discloses all the elements of claim 1 for all the reasons provided above.
[3.2] wherein the first and second information are transmitted using the same	Rofougaran discloses “wherein the first and second information are transmitted using the same power amplifier in said wireless transmitter.” See, e.g.:

Claim 3 of the '802 Patent	Prior Art Reference – Rofougaran
<p>power amplifier in said wireless transmitter.</p>	<p>The diagram illustrates a wireless transmitter architecture. It begins with two baseband signal paths: 'First Baseband Signal' (201) and 'Second Baseband Signal' (202). These signals are processed by a 'Spectral Placement Module' (210), which generates local oscillator signals (211, 212) centered at frequencies f_s. The module also outputs signals (203, 204) to a 'Signal Combiner' (230). The 'Signal Combiner' also receives a local oscillator signal (246) from a 'LO' source (246) and a reference signal (248). The combined signal (247) is then fed into a 'PA' (Power Amplifier) module (250), which includes a power amplifier (252) and a duplexer (254). The PA module also receives a local oscillator signal (240) from the LO source (246). The final output signal (242) is transmitted at frequency f_{RF}. Frequency markers $-f_s$, f_s, and f_{RF} are indicated along the horizontal axis.</p>

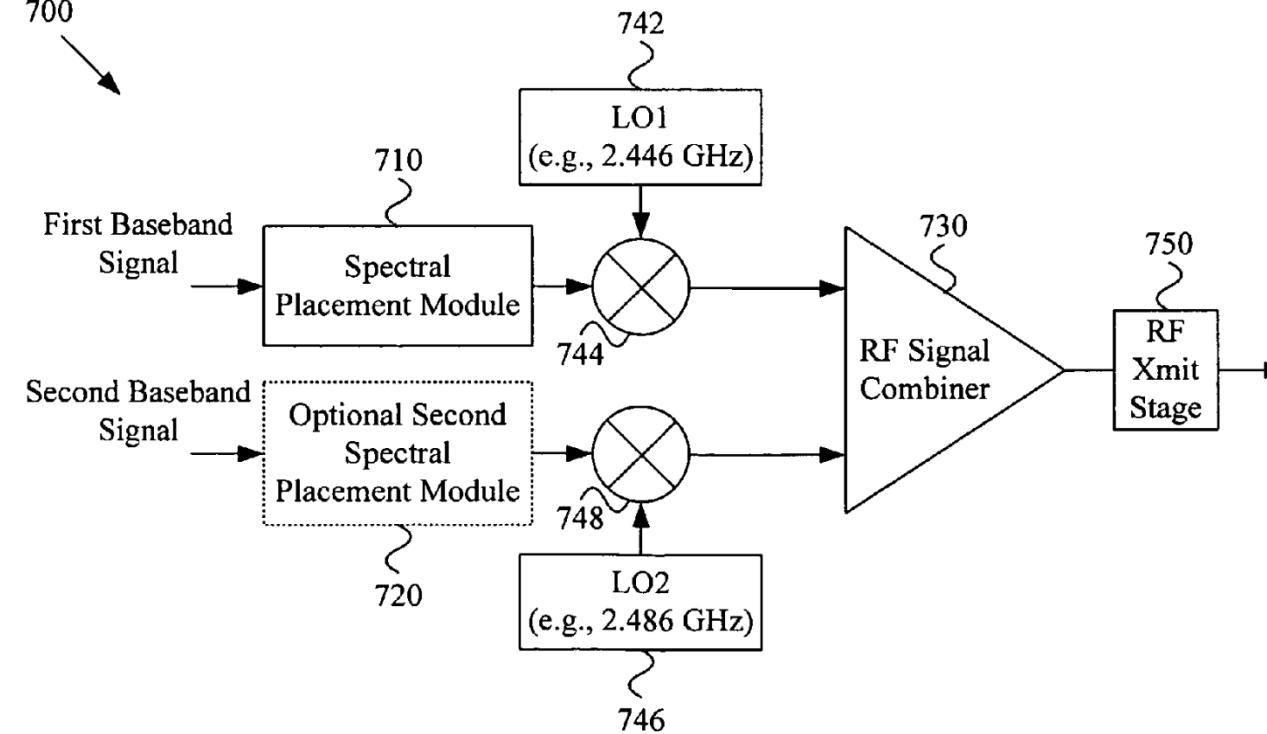
Figure 2

See, e.g., Rofougaran at Figure 2.

Claim 3 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>The diagram illustrates a signal processing chain for RF transmission. It begins with two baseband signals: the 1st Baseband Signal and the 2nd Baseband Signal. These signals are processed by two DACs (Digital-to-Analog Converters), labeled 592 and 594. The outputs of the DACs are fed into a Spectral Placement Module (510) and an optional second spectral placement module (520). The outputs from the modules are combined at a Signal Combiner (530). The combined signal then passes through an Upconverter (540) and an RF Xmit Stage (550) before being transmitted.</p>

Figure 5

See, e.g., Rofougaran at Figure 5.

Claim 3 of the '802 Patent	Prior Art Reference – Rofougaran
	 <p>Figure 7</p> <p>See, e.g., Rofougaran at Figure 7.</p> <p>FIG. 1 is a diagram showing a portion of a first non-limiting exemplary communication system 100, in accordance with various aspects of the present invention. The communication system (or device) may comprise characteristics of any of a variety of communication systems/devices (e.g., multimode wireless communication devices). For example and without limitation, the communication system may comprise characteristics of any of a variety of mobile wireless communication devices (e.g.,</p>

Claim 3 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>cellular phones, paging devices, portable email devices, etc.). Also for example, the communication system may comprise characteristics of fixed communication systems or devices (e.g., network access points, base stations, satellites, wireless routers, set top boxes, etc.). Further for example, the communication system may comprise characteristics of a variety of electronic devices with wireless communication capability (e.g., televisions, music players, cameras, remote controls, personal digital assistants, handheld computers, gaming devices, etc.). Accordingly, the scope of various aspects of the present invention should not be limited by characteristics of particular communication systems or devices.</p> <p>The following discussion will, at times, refer to various communication modes. A multimode communication device may, for example, be adapted to communicate in a plurality of such communication modes. For the following discussion, a communication mode may generally be considered to coincide with communication utilizing a particular communication protocol or standard. A non-limiting list of exemplary communication protocols includes various cellular communication protocols (e.g., GSM, GPRS, EDGE, CDMA, WCDMA, TDMA, PDC, etc.), various wireless networking protocols or standards, including WLAN, WMAN, WPAN and WWAN (e.g., IEEE 802.11, Bluetooth, IEEE 802.15, UWB, IEEE 802.16, IEEE 802.20, Zigbee, any WiFi protocol, etc.), various television communication standards, etc. The scope of various aspects of the present invention should not be limited by characteristics of particular communication modes or protocols, whether standard or proprietary.</p> <p>The exemplary communication system 100 may comprise at least a first input 101 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to any of the previously mentioned communication protocols.</p> <p>The exemplary communication system 100 may also comprise at least a second input 102 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first</p>

Claim 3 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>communication protocol discussed above). For example and without limitation, the second baseband signal may correspond to any of the previously mentioned communication protocols. The first baseband signal and the second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of the communication system 100. For example, such modules may generate the first and second baseband signals independently (e.g., corresponding to independent respective communications). Alternatively, for example, such modules may generate the first and second baseband signals in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first and second baseband signals for a single communication).</p> <p>The exemplary communication system 100 may additionally comprise a spectral placement module 110 that is adapted to spectrally shift the first baseband signal (i.e., shift the frequency spectrum of the first baseband signal). In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to spectrally shift the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with the second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to implement a frequency-hopping scheme with the first baseband signal. For example, in a scenario, where there are one or more frequency bands (e.g., a second frequency space) associated with the second baseband signal, the spectral placement module 110 may be adapted to shift the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p><i>See, e.g., Rofougaran at 2:38-3:58.</i></p> <p>The exemplary communication system 100 may also comprise a second spectral placement module 120. Such a second spectral placement module 120 may, for example, share any or all characteristics</p>

Claim 3 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>with the spectral placement module 110 discussed previously. The incorporation of such a second spectral placement module 120 may, for example, provide spectral shifting flexibility. For example, in such an exemplary configuration, either or both of the first and second baseband signals may be spectrally shifted to substantially distinct frequency spaces. Also for example, in such an exemplary configuration, either or both of the first and second baseband signals may be frequency hopped. Note that though the second spectral placement module 120 is illustrated separate from the first spectral placement module 110, the second spectral placement module 120 may share any or all hardware and/or software components with the spectral placement module 110.</p> <p>The exemplary communication system 100 may further comprise a signal combiner 130 that is adapted to generate a composite signal comprising various input signals to the signal combiner 130. For example, the composite signal may simultaneously (i.e., at an instant in time) comprise components associated with various input signals. Note that such simultaneity need not always be present. For example, at a first instant in time, the signal output from the signal combiner 130 might comprise a plurality of components associated with a plurality of respective input signals, at a second instant in time, the signal output from the signal combiner 130 might comprise a single component associated with a single respective input signal, and at a third instant in time, the signal output from the signal combiner 130 might comprise no components.</p> <p>In a first non-limiting exemplary scenario, the signal combiner 130 may receive a first signal that is based on the first baseband signal (e.g., associated with a first communication protocol). Also, the signal combiner 130 may receive a second signal that is based on the second baseband signal (e.g., associated with a second communication protocol). In such a scenario, the signal combiner 130 may combine the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the first baseband signal and a second signal component based on the second baseband signal. In such a scenario, for example where the frequency spectra of the first and second baseband signals do not overlap, the first and second baseband signals might not be spectrally shifted prior to combining by the signal combiner 130. In such a scenario, the spectral placement module 110 (and optionally, the second spectral placement module 120) may receive a control signal indicating whether or not to perform spectral shifting and/or to what degree spectral shifting should be implemented.</p>

Claim 3 of the '802 Patent	Prior Art Reference – Rofougaran
	<p><i>See, e.g.</i>, Rofougaran at 4:16-67.</p> <p>Various components of the exemplary communication system 100 (and other communication systems illustrated and discussed herein) may be implemented in analog and/or digital circuitry. To illustrate this, the exemplary communication system 100 is not shown with analog-to-digital converters (ADCs) or digital-to-analog converters (DACs). FIGS. 4-6, to be discussed later, show various non-limiting exemplary configurations including such converters.</p> <p>FIG. 2 is a diagram showing a portion of a second non-limiting exemplary communication system 200, in accordance with various aspects of the present invention. The communication system 200 may, for example and without limitation, share any or all characteristics with the communication system 100 illustrated in FIG. 1 and discussed previously.</p> <p>The exemplary communication system 200 may comprise at least a first input 201 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to the Bluetooth communication protocol. FIG. 2 shows an exemplary frequency spectrum 203 associated with the first baseband signal.</p> <p>The exemplary communication system 200 may also comprise at least a second input 202 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first communication protocol discussed above). For example and without limitation, the first baseband signal may correspond to an IEEE 802.11 communication protocol (e.g., IEEE 802.11(b) or IEEE 802.11(g)). FIG. 2 shows an exemplary frequency spectrum 204 associated with the second baseband signal.</p> <p><i>See, e.g.</i>, Rofougaran at 5:64-6:31.</p>

Claim 3 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>In a non-limiting exemplary configuration illustrated in FIG. 2, the signal combiner 230 receives a first signal from the spectral placement module 210 that is based on the spectrally shifted first baseband signal. Also, the signal combiner 230 receives a second signal that is based on the second baseband signal. In such a configuration, the signal combiner 230 combines the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the spectrally shifted first baseband signal and a second signal component based on the second baseband signal (e.g., not spectrally shifted).</p> <p>FIG. 2 shows an exemplary frequency spectrum 231 associated with the composite signal formed by the signal combiner 230. The spectrum 231 comprises a first portion 233 corresponding to the first signal component, and a second portion 232 corresponding to the second signal component. Note that the first portion 233 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 232.</p> <p>The exemplary communication system 200 may also comprise an upconverter 240 adapted to upconvert a signal (e.g., the composite signal from the signal combiner 230) for transmission. The upconverter 240 may, for example and without limitation, share any or all characteristics with the upconverter 140 discussed previously.</p> <p>The upconverter 240 may, for example, comprise a mixer 247, a local oscillator 246 and one or more filters 248. The mixer 247 may, for example, receive the composite signal from the signal combiner 230 and an RF mixing signal at frequency fRF from a local oscillator 246. The upconverter 240 may, for example, filter the upconverted signal from the mixer 247 with one or more filters 248. The output of the upconverter 240 may, for example, comprise a signal indicative of the composite signal spectrally shifted to an RF frequency.</p> <p>FIG. 2 shows an exemplary frequency spectrum 241 associated with the RF signal formed by the upconverter 240. The frequency spectrum 241 comprises a first portion 243 corresponding to the first signal component and a second portion 242 corresponding to the second signal component. Note that the first portion 243 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 242. Also note that the first portion 243 and</p>

Claim 3 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>second portion 242 might be formed with a first mirror portion 244 and second mirror portion 245, respectively. Note that a mirror portion may either be removed or may be kept for later processing. The exemplary communication system 200 may further comprise a RF transmission stage 250 adapted to transmit an RF signal. The RF transmission stage 250 may, for example and without limitation, share any or all characteristics with the RF transmission stage 150 discussed previously. Such an RF signal may, for example, be associated with the composite signal output from the signal combiner 230 and upconverted by the upconverter 240. The RF transmission stage 250 may, for example and without limitation, comprise a power amplifier 252, antenna 254 and other components generally associated with RF signal transmission.</p> <p><i>See, e.g., Rofougaran at 6:66-7:57.</i></p> <p>For example, the spectral placement module 510, optional second spectral placement module 520 and signal combiner 530 may operate in the analog domain. The first digital-to-analog converter 592 may convert the first baseband signal to the analog domain for processing by the spectral placement module 510. The second digital-to-analog converter 594 may convert the second baseband signal to the analog domain for processing by the second spectral placement module 520 or signal combiner 530. The signal combiner 530 then combines signals in the analog domain to generate an analog composite signal, which is then upconverted and transmitted by the upconverter 540 and RF transmission stage 550, respectively.</p> <p><i>See, e.g., Rofougaran at 9:30-41.</i></p> <p>FIG. 7 is a diagram showing a portion of a seventh non-limiting exemplary communication system 700, in accordance with various aspects of the present invention. The exemplary communication system 700 may, for example and without limitation, share any or all characteristics with the exemplary systems 100-600 illustrated in FIGS. 1-6 and discussed previously.</p> <p>The exemplary communication system 700 may comprise a first mixer 744 that receives a spectrally shifted first baseband signal from the spectral placement module 710 and a first RF mixing signal (e.g., a 2.446 GHz signal generally associated with the Bluetooth communication protocol) from a</p>

Claim 3 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>first local oscillator 742. The exemplary communication system 700 may also comprise a second mixer 748 that receives a second baseband signal (or a spectrally shifted second baseband signal) and a second RF mixing signal (e.g., a 2.486 GHz signal generally associated with the IEEE 802.11(g) communication protocol) from a second local oscillator 746.</p> <p>The exemplary communication system 700 may comprise an RF signal combiner 730 that is adapted to combine input RF signals. The RF signal combiner 730 may, for example, receive and combine the output signals from the first mixer 744 and second mixer 748 to generate an RF composite signal. The exemplary communication system 700 may also comprise a RF transmission stage 750 that receives the RF composite signal from the RF signal combiner 730 and transmit the signal.</p> <p><i>See, e.g., Rofougaran at 10:18-43.</i></p> <p>The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 810 comprises receiving the first baseband signal, step 810 may comprise receiving the first baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The first baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 810 may, for example, comprise generating the first baseband signal independently (e.g., corresponding to an independent communication). Step 810 may alternatively, for example, comprise generating the first baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first baseband signal and other baseband signals for a single communication).</p> <p>The exemplary method 800 may, at step 820, comprise spectrally placing (or shifting) the first baseband signal (e.g., received at step 810). Step 820 may, for example and without limitation, share any or all functional characteristics with the spectral placement modules 110-710 of the exemplary systems 100-700 illustrated in FIGS. 1-7 and discussed previously.</p>

Claim 3 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>Step 820 may, for example, comprise spectrally shifting the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with a second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, step 820 may comprise implementing a frequency-hopping scheme with the first baseband signal. For example, in a scenario where there are one or more frequency bands (e.g., a second frequency space) associated with a second baseband signal, step 820 may comprise spectrally shifting the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p>In another non-limiting exemplary scenario, spectrally shifting the first baseband signal may result in the production of a spectral image (e.g., frequency content mirrored about a mixing frequency utilized to spectrally shift the first baseband signal). In such a scenario, step 820 may comprise accepting or rejecting the image.</p> <p>In a scenario where an image is rejected, step 820 may comprise rejecting the image in any of a variety of manners. For example and without limitation, step 820 may comprise performing image reject mixing to spectrally shift the first baseband signal. Such image reject mixing generally comprises spectrally shifting a signal and rejecting an image associated with the spectrally shifted signal. Also for example, step 820 may comprise filtering out an unwanted image. The scope of various aspects of the present invention should not be limited by the utilization of image rejection or by any particular manner of performing such image rejection.</p> <p>The exemplary method 800 may, at step 830, comprise generating and/or receiving a second baseband signal corresponding to a second communication protocol (e.g., different from the first communication protocol). Step 830 may, for example and without limitation, share any or all functional characteristics with the second input 102 of the exemplary system 100 illustrated in FIG. 1 and discussed previously.</p>

Claim 3 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>The second baseband signal may, for example, correspond to a second communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 830 comprises receiving the second baseband signal, step 830 may comprise receiving the second baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 830 may, for example, comprise generating the second baseband signal independently (e.g., corresponding to a communication independent of a communication associated with the first baseband signal). Step 830 may alternatively, for example, comprise generating the second baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the second baseband signal and the first baseband signal for a single communication).</p> <p><i>See, e.g., Rofougaran at 11:53-13:4.</i></p> <p>Furthermore, this claim element is obvious in light of Rofougaran itself, when combined with any of the other references as charted for this claim element in Exs. A-1–A-31, First Supplemental Ex. A-Obviousness Chart, and/or when combined with the knowledge of one of ordinary skill in the art. Motivations to combine may come from the knowledge of the person of ordinary skill themselves, or from the known problems and predictable solutions as embodied in these references. Further motivations to combine references and additional details may be found in the Cover Pleading and First Supplemental Ex. A-Obviousness Chart.</p>

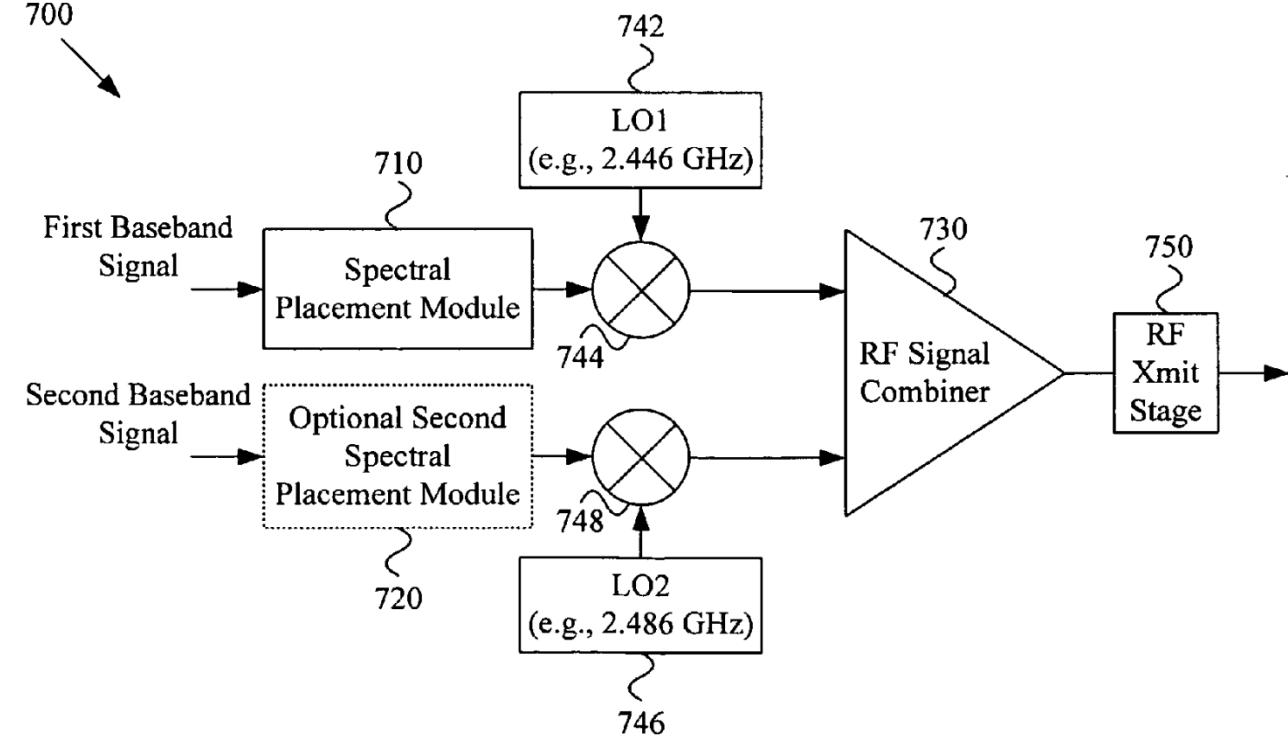
Claim 4 of the '802 Patent	Prior Art Reference – Rofougaran
[4.1] The method of claim 3	Rofougaran discloses all the elements of claim 3 for all the reasons provided above.
[4.2] wherein the bandwidth of said power amplifier is greater than the difference	Rofougaran discloses “wherein the bandwidth of said power amplifier is greater than the difference between the first lowest frequency and the second highest frequency.” See, e.g.:

Claim 4 of the '802 Patent	Prior Art Reference – Rofougaran
<p>between the first lowest frequency and the second highest frequency.</p>	<p>The diagram illustrates a signal processing system for spectral placement. It starts with two baseband signals: 'First Baseband Signal' (201) and 'Second Baseband Signal' (202), which are fed into a 'Spectral Placement Module' (210). This module outputs signals 211 and 212, which are positioned at frequencies $-f_s$ and f_s respectively. These signals are then combined by a 'Signal Combiner' (230) along with other signals 213 and 214. The combined signal 247 is fed into a mixer (247), which also receives a Local Oscillator (LO) signal 246. The mixer's output 241 is then processed by a power amplifier (PA) 250, resulting in the final RF signal 252 at frequency f_{RF}. Frequency markers $-f_s$, f_s, and f_{RF} are indicated on the frequency axis.</p>

Figure 2

See, e.g., Rofougaran at Figure 2.

Claim 4 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>Figure 5</p> <p>See, e.g., Rofougaran at Figure 5.</p>

Claim 4 of the '802 Patent	Prior Art Reference – Rofougaran
	 <p>Figure 7</p> <p>See, e.g., Rofougaran at Figure 7.</p> <p>FIG. 1 is a diagram showing a portion of a first non-limiting exemplary communication system 100, in accordance with various aspects of the present invention. The communication system (or device) may comprise characteristics of any of a variety of communication systems/devices (e.g., multimode wireless communication devices). For example and without limitation, the communication system may comprise characteristics of any of a variety of mobile wireless communication devices (e.g.,</p>

Claim 4 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>cellular phones, paging devices, portable email devices, etc.). Also for example, the communication system may comprise characteristics of fixed communication systems or devices (e.g., network access points, base stations, satellites, wireless routers, set top boxes, etc.). Further for example, the communication system may comprise characteristics of a variety of electronic devices with wireless communication capability (e.g., televisions, music players, cameras, remote controls, personal digital assistants, handheld computers, gaming devices, etc.). Accordingly, the scope of various aspects of the present invention should not be limited by characteristics of particular communication systems or devices.</p> <p>The following discussion will, at times, refer to various communication modes. A multimode communication device may, for example, be adapted to communicate in a plurality of such communication modes. For the following discussion, a communication mode may generally be considered to coincide with communication utilizing a particular communication protocol or standard. A non-limiting list of exemplary communication protocols includes various cellular communication protocols (e.g., GSM, GPRS, EDGE, CDMA, WCDMA, TDMA, PDC, etc.), various wireless networking protocols or standards, including WLAN, WMAN, WPAN and WWAN (e.g., IEEE 802.11, Bluetooth, IEEE 802.15, UWB, IEEE 802.16, IEEE 802.20, Zigbee, any WiFi protocol, etc.), various television communication standards, etc. The scope of various aspects of the present invention should not be limited by characteristics of particular communication modes or protocols, whether standard or proprietary.</p> <p>The exemplary communication system 100 may comprise at least a first input 101 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to any of the previously mentioned communication protocols.</p> <p>The exemplary communication system 100 may also comprise at least a second input 102 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first</p>

Claim 4 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>communication protocol discussed above). For example and without limitation, the second baseband signal may correspond to any of the previously mentioned communication protocols. The first baseband signal and the second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of the communication system 100. For example, such modules may generate the first and second baseband signals independently (e.g., corresponding to independent respective communications). Alternatively, for example, such modules may generate the first and second baseband signals in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first and second baseband signals for a single communication).</p> <p>The exemplary communication system 100 may additionally comprise a spectral placement module 110 that is adapted to spectrally shift the first baseband signal (i.e., shift the frequency spectrum of the first baseband signal). In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to spectrally shift the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with the second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to implement a frequency-hopping scheme with the first baseband signal. For example, in a scenario, where there are one or more frequency bands (e.g., a second frequency space) associated with the second baseband signal, the spectral placement module 110 may be adapted to shift the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p><i>See, e.g., Rofougaran at 2:38-3:58.</i></p> <p>The exemplary communication system 100 may also comprise a second spectral placement module 120. Such a second spectral placement module 120 may, for example, share any or all characteristics</p>

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	<p>with the spectral placement module 110 discussed previously. The incorporation of such a second spectral placement module 120 may, for example, provide spectral shifting flexibility. For example, in such an exemplary configuration, either or both of the first and second baseband signals may be spectrally shifted to substantially distinct frequency spaces. Also for example, in such an exemplary configuration, either or both of the first and second baseband signals may be frequency hopped. Note that though the second spectral placement module 120 is illustrated separate from the first spectral placement module 110, the second spectral placement module 120 may share any or all hardware and/or software components with the spectral placement module 110.</p> <p>The exemplary communication system 100 may further comprise a signal combiner 130 that is adapted to generate a composite signal comprising various input signals to the signal combiner 130. For example, the composite signal may simultaneously (i.e., at an instant in time) comprise components associated with various input signals. Note that such simultaneity need not always be present. For example, at a first instant in time, the signal output from the signal combiner 130 might comprise a plurality of components associated with a plurality of respective input signals, at a second instant in time, the signal output from the signal combiner 130 might comprise a single component associated with a single respective input signal, and at a third instant in time, the signal output from the signal combiner 130 might comprise no components.</p> <p>In a first non-limiting exemplary scenario, the signal combiner 130 may receive a first signal that is based on the first baseband signal (e.g., associated with a first communication protocol). Also, the signal combiner 130 may receive a second signal that is based on the second baseband signal (e.g., associated with a second communication protocol). In such a scenario, the signal combiner 130 may combine the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the first baseband signal and a second signal component based on the second baseband signal. In such a scenario, for example where the frequency spectra of the first and second baseband signals do not overlap, the first and second baseband signals might not be spectrally shifted prior to combining by the signal combiner 130. In such a scenario, the spectral placement module 110 (and optionally, the second spectral placement module 120) may receive a control signal indicating whether or not to perform spectral shifting and/or to what degree spectral shifting should be implemented.</p>

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	<p><i>See, e.g.</i>, Rofougaran at 4:16-67.</p> <p>Various components of the exemplary communication system 100 (and other communication systems illustrated and discussed herein) may be implemented in analog and/or digital circuitry. To illustrate this, the exemplary communication system 100 is not shown with analog-to-digital converters (ADCs) or digital-to-analog converters (DACs). FIGS. 4-6, to be discussed later, show various non-limiting exemplary configurations including such converters.</p> <p>FIG. 2 is a diagram showing a portion of a second non-limiting exemplary communication system 200, in accordance with various aspects of the present invention. The communication system 200 may, for example and without limitation, share any or all characteristics with the communication system 100 illustrated in FIG. 1 and discussed previously.</p> <p>The exemplary communication system 200 may comprise at least a first input 201 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to the Bluetooth communication protocol. FIG. 2 shows an exemplary frequency spectrum 203 associated with the first baseband signal.</p> <p>The exemplary communication system 200 may also comprise at least a second input 202 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first communication protocol discussed above). For example and without limitation, the first baseband signal may correspond to an IEEE 802.11 communication protocol (e.g., IEEE 802.11(b) or IEEE 802.11(g)). FIG. 2 shows an exemplary frequency spectrum 204 associated with the second baseband signal.</p> <p><i>See, e.g.</i>, Rofougaran at 5:64-6:31.</p>

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	<p>In a non-limiting exemplary configuration illustrated in FIG. 2, the signal combiner 230 receives a first signal from the spectral placement module 210 that is based on the spectrally shifted first baseband signal. Also, the signal combiner 230 receives a second signal that is based on the second baseband signal. In such a configuration, the signal combiner 230 combines the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the spectrally shifted first baseband signal and a second signal component based on the second baseband signal (e.g., not spectrally shifted).</p> <p>FIG. 2 shows an exemplary frequency spectrum 231 associated with the composite signal formed by the signal combiner 230. The spectrum 231 comprises a first portion 233 corresponding to the first signal component, and a second portion 232 corresponding to the second signal component. Note that the first portion 233 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 232.</p> <p>The exemplary communication system 200 may also comprise an upconverter 240 adapted to upconvert a signal (e.g., the composite signal from the signal combiner 230) for transmission. The upconverter 240 may, for example and without limitation, share any or all characteristics with the upconverter 140 discussed previously.</p> <p>The upconverter 240 may, for example, comprise a mixer 247, a local oscillator 246 and one or more filters 248. The mixer 247 may, for example, receive the composite signal from the signal combiner 230 and an RF mixing signal at frequency fRF from a local oscillator 246. The upconverter 240 may, for example, filter the upconverted signal from the mixer 247 with one or more filters 248. The output of the upconverter 240 may, for example, comprise a signal indicative of the composite signal spectrally shifted to an RF frequency.</p> <p>FIG. 2 shows an exemplary frequency spectrum 241 associated with the RF signal formed by the upconverter 240. The frequency spectrum 241 comprises a first portion 243 corresponding to the first signal component and a second portion 242 corresponding to the second signal component. Note that the first portion 243 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 242. Also note that the first portion 243 and</p>

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	<p>second portion 242 might be formed with a first mirror portion 244 and second mirror portion 245, respectively. Note that a mirror portion may either be removed or may be kept for later processing. The exemplary communication system 200 may further comprise a RF transmission stage 250 adapted to transmit an RF signal. The RF transmission stage 250 may, for example and without limitation, share any or all characteristics with the RF transmission stage 150 discussed previously. Such an RF signal may, for example, be associated with the composite signal output from the signal combiner 230 and upconverted by the upconverter 240. The RF transmission stage 250 may, for example and without limitation, comprise a power amplifier 252, antenna 254 and other components generally associated with RF signal transmission.</p> <p><i>See, e.g., Rofougaran at 6:66-7:57.</i></p> <p>For example, the spectral placement module 510, optional second spectral placement module 520 and signal combiner 530 may operate in the analog domain. The first digital-to-analog converter 592 may convert the first baseband signal to the analog domain for processing by the spectral placement module 510. The second digital-to-analog converter 594 may convert the second baseband signal to the analog domain for processing by the second spectral placement module 520 or signal combiner 530. The signal combiner 530 then combines signals in the analog domain to generate an analog composite signal, which is then upconverted and transmitted by the upconverter 540 and RF transmission stage 550, respectively.</p> <p><i>See, e.g., Rofougaran at 9:30-41.</i></p> <p>FIG. 7 is a diagram showing a portion of a seventh non-limiting exemplary communication system 700, in accordance with various aspects of the present invention. The exemplary communication system 700 may, for example and without limitation, share any or all characteristics with the exemplary systems 100-600 illustrated in FIGS. 1-6 and discussed previously.</p> <p>The exemplary communication system 700 may comprise a first mixer 744 that receives a spectrally shifted first baseband signal from the spectral placement module 710 and a first RF mixing signal (e.g., a 2.446 GHz signal generally associated with the Bluetooth communication protocol) from a</p>

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	<p>first local oscillator 742. The exemplary communication system 700 may also comprise a second mixer 748 that receives a second baseband signal (or a spectrally shifted second baseband signal) and a second RF mixing signal (e.g., a 2.486 GHz signal generally associated with the IEEE 802.11(g) communication protocol) from a second local oscillator 746.</p> <p>The exemplary communication system 700 may comprise an RF signal combiner 730 that is adapted to combine input RF signals. The RF signal combiner 730 may, for example, receive and combine the output signals from the first mixer 744 and second mixer 748 to generate an RF composite signal. The exemplary communication system 700 may also comprise a RF transmission stage 750 that receives the RF composite signal from the RF signal combiner 730 and transmit the signal.</p> <p><i>See, e.g., Rofougaran at 10:18-43.</i></p> <p>The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 810 comprises receiving the first baseband signal, step 810 may comprise receiving the first baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The first baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 810 may, for example, comprise generating the first baseband signal independently (e.g., corresponding to an independent communication). Step 810 may alternatively, for example, comprise generating the first baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first baseband signal and other baseband signals for a single communication).</p> <p>The exemplary method 800 may, at step 820, comprise spectrally placing (or shifting) the first baseband signal (e.g., received at step 810). Step 820 may, for example and without limitation, share any or all functional characteristics with the spectral placement modules 110-710 of the exemplary systems 100-700 illustrated in FIGS. 1-7 and discussed previously.</p>

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	<p>Step 820 may, for example, comprise spectrally shifting the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with a second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, step 820 may comprise implementing a frequency-hopping scheme with the first baseband signal. For example, in a scenario where there are one or more frequency bands (e.g., a second frequency space) associated with a second baseband signal, step 820 may comprise spectrally shifting the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p>In another non-limiting exemplary scenario, spectrally shifting the first baseband signal may result in the production of a spectral image (e.g., frequency content mirrored about a mixing frequency utilized to spectrally shift the first baseband signal). In such a scenario, step 820 may comprise accepting or rejecting the image.</p> <p>In a scenario where an image is rejected, step 820 may comprise rejecting the image in any of a variety of manners. For example and without limitation, step 820 may comprise performing image reject mixing to spectrally shift the first baseband signal. Such image reject mixing generally comprises spectrally shifting a signal and rejecting an image associated with the spectrally shifted signal. Also for example, step 820 may comprise filtering out an unwanted image. The scope of various aspects of the present invention should not be limited by the utilization of image rejection or by any particular manner of performing such image rejection.</p> <p>The exemplary method 800 may, at step 830, comprise generating and/or receiving a second baseband signal corresponding to a second communication protocol (e.g., different from the first communication protocol). Step 830 may, for example and without limitation, share any or all functional characteristics with the second input 102 of the exemplary system 100 illustrated in FIG. 1 and discussed previously.</p>

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	<p>The second baseband signal may, for example, correspond to a second communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 830 comprises receiving the second baseband signal, step 830 may comprise receiving the second baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 830 may, for example, comprise generating the second baseband signal independently (e.g., corresponding to a communication independent of a communication associated with the first baseband signal). Step 830 may alternatively, for example, comprise generating the second baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the second baseband signal and the first baseband signal for a single communication).</p> <p><i>See, e.g.</i>, Rofougaran at 11:53-13:4.</p> <p>Furthermore, this claim element is obvious in light of Rofougaran itself, when combined with any of the other references as charted for this claim element in Exs. A-1–A-31, First Supplemental Ex. A-Obviousness Chart, and/or when combined with the knowledge of one of ordinary skill in the art. Motivations to combine may come from the knowledge of the person of ordinary skill themselves, or from the known problems and predictable solutions as embodied in these references. Further motivations to combine references and additional details may be found in the Cover Pleading and First Supplemental Ex. A-Obviousness Chart.</p>

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[6.1] The method of claim 1	Rofougaran discloses all the elements of claim 1 for all the reasons provided above.
[6.2] wherein the first information corresponds to a first wireless protocol and the	Rofougaran discloses “wherein the first information corresponds to a first wireless protocol and the second information corresponds to a second wireless protocol.” See, e.g.:

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second information corresponds to a second wireless protocol.	<p>FIG. 1 is a diagram showing a portion of a first non-limiting exemplary communication system 100, in accordance with various aspects of the present invention. The communication system (or device) may comprise characteristics of any of a variety of communication systems/devices (e.g., multimode wireless communication devices). For example and without limitation, the communication system may comprise characteristics of any of a variety of mobile wireless communication devices (e.g., cellular phones, paging devices, portable email devices, etc.). Also for example, the communication system may comprise characteristics of fixed communication systems or devices (e.g., network access points, base stations, satellites, wireless routers, set top boxes, etc.). Further for example, the communication system may comprise characteristics of a variety of electronic devices with wireless communication capability (e.g., televisions, music players, cameras, remote controls, personal digital assistants, handheld computers, gaming devices, etc.). Accordingly, the scope of various aspects of the present invention should not be limited by characteristics of particular communication systems or devices.</p> <p>The following discussion will, at times, refer to various communication modes. A multimode communication device may, for example, be adapted to communicate in a plurality of such communication modes. For the following discussion, a communication mode may generally be considered to coincide with communication utilizing a particular communication protocol or standard. A non-limiting list of exemplary communication protocols includes various cellular communication protocols (e.g., GSM, GPRS, EDGE, CDMA, WCDMA, TDMA, PDC, etc.), various wireless networking protocols or standards, including WLAN, WMAN, WPAN and WWAN (e.g., IEEE 802.11, Bluetooth, IEEE 802.15, UWB, IEEE 802.16, IEEE 802.20, Zigbee, any WiFi protocol, etc.), various television communication standards, etc. The scope of various aspects of the present invention should not be limited by characteristics of particular communication modes or protocols, whether standard or proprietary.</p> <p>The exemplary communication system 100 may comprise at least a first input 101 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to any of the previously mentioned communication protocols.</p>

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	<p>The exemplary communication system 100 may also comprise at least a second input 102 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first communication protocol discussed above). For example and without limitation, the second baseband signal may correspond to any of the previously mentioned communication protocols.</p> <p>The first baseband signal and the second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of the communication system 100. For example, such modules may generate the first and second baseband signals independently (e.g., corresponding to independent respective communications). Alternatively, for example, such modules may generate the first and second baseband signals in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first and second baseband signals for a single communication).</p> <p>The exemplary communication system 100 may additionally comprise a spectral placement module 110 that is adapted to spectrally shift the first baseband signal (i.e., shift the frequency spectrum of the first baseband signal). In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to spectrally shift the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with the second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to implement a frequency-hopping scheme with the first baseband signal. For example, in a scenario, where there are one or more frequency bands (e.g., a second frequency space) associated with the second baseband signal, the spectral placement module 110 may be adapted to shift the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p>

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	<p><i>See, e.g., Rofougaran at 2:38-3:58.</i></p> <p>The exemplary communication system 100 may also comprise a second spectral placement module 120. Such a second spectral placement module 120 may, for example, share any or all characteristics with the spectral placement module 110 discussed previously. The incorporation of such a second spectral placement module 120 may, for example, provide spectral shifting flexibility. For example, in such an exemplary configuration, either or both of the first and second baseband signals may be spectrally shifted to substantially distinct frequency spaces. Also for example, in such an exemplary configuration, either or both of the first and second baseband signals may be frequency hopped. Note that though the second spectral placement module 120 is illustrated separate from the first spectral placement module 110, the second spectral placement module 120 may share any or all hardware and/or software components with the spectral placement module 110.</p> <p>The exemplary communication system 100 may further comprise a signal combiner 130 that is adapted to generate a composite signal comprising various input signals to the signal combiner 130. For example, the composite signal may simultaneously (i.e., at an instant in time) comprise components associated with various input signals. Note that such simultaneity need not always be present. For example, at a first instant in time, the signal output from the signal combiner 130 might comprise a plurality of components associated with a plurality of respective input signals, at a second instant in time, the signal output from the signal combiner 130 might comprise a single component associated with a single respective input signal, and at a third instant in time, the signal output from the signal combiner 130 might comprise no components.</p> <p>In a first non-limiting exemplary scenario, the signal combiner 130 may receive a first signal that is based on the first baseband signal (e.g., associated with a first communication protocol). Also, the signal combiner 130 may receive a second signal that is based on the second baseband signal (e.g., associated with a second communication protocol). In such a scenario, the signal combiner 130 may combine the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the first baseband signal and a second signal component based on the second baseband signal. In such a scenario, for example where the frequency spectra of the first and second baseband signals do not overlap, the first and second</p>

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	<p>baseband signals might not be spectrally shifted prior to combining by the signal combiner 130. In such a scenario, the spectral placement module 110 (and optionally, the second spectral placement module 120) may receive a control signal indicating whether or not to perform spectral shifting and/or to what degree spectral shifting should be implemented.</p> <p><i>See, e.g., Rofougaran at 4:16-67.</i></p> <p>Various components of the exemplary communication system 100 (and other communication systems illustrated and discussed herein) may be implemented in analog and/or digital circuitry. To illustrate this, the exemplary communication system 100 is not shown with analog-to-digital converters (ADCs) or digital-to-analog converters (DACs). FIGS. 4-6, to be discussed later, show various non-limiting exemplary configurations including such converters.</p> <p>FIG. 2 is a diagram showing a portion of a second non-limiting exemplary communication system 200, in accordance with various aspects of the present invention. The communication system 200 may, for example and without limitation, share any or all characteristics with the communication system 100 illustrated in FIG. 1 and discussed previously.</p> <p>The exemplary communication system 200 may comprise at least a first input 201 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to the Bluetooth communication protocol. FIG. 2 shows an exemplary frequency spectrum 203 associated with the first baseband signal.</p> <p>The exemplary communication system 200 may also comprise at least a second input 202 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first communication protocol discussed above). For example and without limitation, the first baseband signal may correspond to an IEEE 802.11 communication protocol (e.g., IEEE 802.11(b) or IEEE</p>

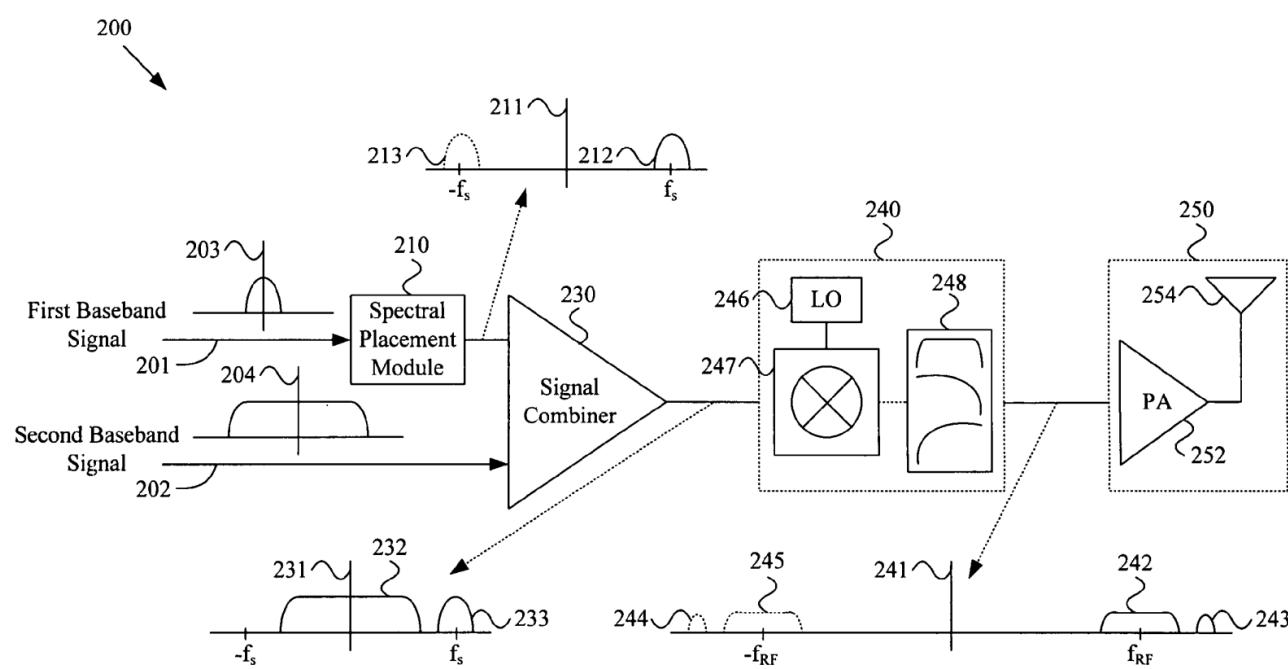
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	<p>802.11(g)). FIG. 2 shows an exemplary frequency spectrum 204 associated with the second baseband signal.</p> <p><i>See, e.g., Rofougaran at 5:64-6:31.</i></p> <p>In a non-limiting exemplary configuration illustrated in FIG. 2, the signal combiner 230 receives a first signal from the spectral placement module 210 that is based on the spectrally shifted first baseband signal. Also, the signal combiner 230 receives a second signal that is based on the second baseband signal. In such a configuration, the signal combiner 230 combines the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the spectrally shifted first baseband signal and a second signal component based on the second baseband signal (e.g., not spectrally shifted).</p> <p>FIG. 2 shows an exemplary frequency spectrum 231 associated with the composite signal formed by the signal combiner 230. The spectrum 231 comprises a first portion 233 corresponding to the first signal component, and a second portion 232 corresponding to the second signal component. Note that the first portion 233 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 232.</p> <p>The exemplary communication system 200 may also comprise an upconverter 240 adapted to upconvert a signal (e.g., the composite signal from the signal combiner 230) for transmission. The upconverter 240 may, for example and without limitation, share any or all characteristics with the upconverter 140 discussed previously.</p> <p>The upconverter 240 may, for example, comprise a mixer 247, a local oscillator 246 and one or more filters 248. The mixer 247 may, for example, receive the composite signal from the signal combiner 230 and an RF mixing signal at frequency fRF from a local oscillator 246. The upconverter 240 may, for example, filter the upconverted signal from the mixer 247 with one or more filters 248. The output of the upconverter 240 may, for example, comprise a signal indicative of the composite signal spectrally shifted to an RF frequency.</p>

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	<p>FIG. 2 shows an exemplary frequency spectrum 241 associated with the RF signal formed by the upconverter 240. The frequency spectrum 241 comprises a first portion 243 corresponding to the first signal component and a second portion 242 corresponding to the second signal component. Note that the first portion 243 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 242. Also note that the first portion 243 and second portion 242 might be formed with a first mirror portion 244 and second mirror portion 245, respectively. Note that a mirror portion may either be removed or may be kept for later processing. The exemplary communication system 200 may further comprise a RF transmission stage 250 adapted to transmit an RF signal. The RF transmission stage 250 may, for example and without limitation, share any or all characteristics with the RF transmission stage 150 discussed previously. Such an RF signal may, for example, be associated with the composite signal output from the signal combiner 230 and upconverted by the upconverter 240. The RF transmission stage 250 may, for example and without limitation, comprise a power amplifier 252, antenna 254 and other components generally associated with RF signal transmission.</p> <p><i>See, e.g., Rofougaran at 6:66-7:57.</i></p> <p>For example, the spectral placement module 510, optional second spectral placement module 520 and signal combiner 530 may operate in the analog domain. The first digital-to-analog converter 592 may convert the first baseband signal to the analog domain for processing by the spectral placement module 510. The second digital-to-analog converter 594 may convert the second baseband signal to the analog domain for processing by the second spectral placement module 520 or signal combiner 530. The signal combiner 530 then combines signals in the analog domain to generate an analog composite signal, which is then upconverted and transmitted by the upconverter 540 and RF transmission stage 550, respectively.</p> <p><i>See, e.g., Rofougaran at 9:30-41.</i></p> <p>FIG. 7 is a diagram showing a portion of a seventh non-limiting exemplary communication system 700, in accordance with various aspects of the present invention. The exemplary communication</p>

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	<p>system 700 may, for example and without limitation, share any or all characteristics with the exemplary systems 100-600 illustrated in FIGS. 1-6 and discussed previously.</p> <p>The exemplary communication system 700 may comprise a first mixer 744 that receives a spectrally shifted first baseband signal from the spectral placement module 710 and a first RF mixing signal (e.g., a 2.446 GHz signal generally associated with the Bluetooth communication protocol) from a first local oscillator 742. The exemplary communication system 700 may also comprise a second mixer 748 that receives a second baseband signal (or a spectrally shifted second baseband signal) and a second RF mixing signal (e.g., a 2.486 GHz signal generally associated with the IEEE 802.11(g) communication protocol) from a second local oscillator 746.</p> <p>The exemplary communication system 700 may comprise an RF signal combiner 730 that is adapted to combine input RF signals. The RF signal combiner 730 may, for example, receive and combine the output signals from the first mixer 744 and second mixer 748 to generate an RF composite signal. The exemplary communication system 700 may also comprise a RF transmission stage 750 that receives the RF composite signal from the RF signal combiner 730 and transmit the signal.</p> <p><i>See, e.g., Rofougaran at 10:18-43.</i></p> <p>The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 810 comprises receiving the first baseband signal, step 810 may comprise receiving the first baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The first baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 810 may, for example, comprise generating the first baseband signal independently (e.g., corresponding to an independent communication). Step 810 may alternatively, for example, comprise generating the first baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first baseband signal and other baseband signals for a single communication).</p>

Claim 6 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>The exemplary method 800 may, at step 820, comprise spectrally placing (or shifting) the first baseband signal (e.g., received at step 810). Step 820 may, for example and without limitation, share any or all functional characteristics with the spectral placement modules 110-710 of the exemplary systems 100-700 illustrated in FIGS. 1-7 and discussed previously.</p> <p>Step 820 may, for example, comprise spectrally shifting the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with a second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, step 820 may comprise implementing a frequency-hopping scheme with the first baseband signal. For example, in a scenario where there are one or more frequency bands (e.g., a second frequency space) associated with a second baseband signal, step 820 may comprise spectrally shifting the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p>In another non-limiting exemplary scenario, spectrally shifting the first baseband signal may result in the production of a spectral image (e.g., frequency content mirrored about a mixing frequency utilized to spectrally shift the first baseband signal). In such a scenario, step 820 may comprise accepting or rejecting the image.</p> <p>In a scenario where an image is rejected, step 820 may comprise rejecting the image in any of a variety of manners. For example and without limitation, step 820 may comprise performing image reject mixing to spectrally shift the first baseband signal. Such image reject mixing generally comprises spectrally shifting a signal and rejecting an image associated with the spectrally shifted signal. Also for example, step 820 may comprise filtering out an unwanted image. The scope of various aspects of the present invention should not be limited by the utilization of image rejection or by any particular manner of performing such image rejection.</p>

Claim 6 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>The exemplary method 800 may, at step 830, comprise generating and/or receiving a second baseband signal corresponding to a second communication protocol (e.g., different from the first communication protocol). Step 830 may, for example and without limitation, share any or all functional characteristics with the second input 102 of the exemplary system 100 illustrated in FIG. 1 and discussed previously.</p> <p>The second baseband signal may, for example, correspond to a second communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 830 comprises receiving the second baseband signal, step 830 may comprise receiving the second baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 830 may, for example, comprise generating the second baseband signal independently (e.g., corresponding to a communication independent of a communication associated with the first baseband signal). Step 830 may alternatively, for example, comprise generating the second baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the second baseband signal and the first baseband signal for a single communication).</p> <p><i>See, e.g., Rofougaran at 11:53-13:4.</i></p> <p>Furthermore, this claim element is obvious in light of Rofougaran itself, when combined with any of the other references as charted for this claim element in Exs. A-1–A-31, First Supplemental Ex. A-Obviousness Chart, and/or when combined with the knowledge of one of ordinary skill in the art. Motivations to combine may come from the knowledge of the person of ordinary skill themselves, or from the known problems and predictable solutions as embodied in these references. Further motivations to combine references and additional details may be found in the Cover Pleading and First Supplemental Ex. A-Obviousness Chart.</p>

Claim 7 of the '802 Patent	Prior Art Reference – Rofougaran
[7.1] The method of claim 1	Rofougaran discloses all the elements of claim 1 for all the reasons provided above.
[7.2] wherein the first information and the second information are the same data transmitted across two different frequencies.	<p>Rofougaran discloses “wherein the first information and the second information are the same data transmitted across two different frequencies.” See, e.g.:</p>  <p>The diagram illustrates a communication system architecture. It starts with two baseband signals: 'First Baseband Signal' (203) and 'Second Baseband Signal' (204). These signals are fed into a 'Spectral Placement Module' (210). The module outputs two signals to a 'Signal Combiner' (230). The 'Signal Combiner' also receives a local oscillator signal from a 'LO' source (246) and combines the signals to produce an intermediate frequency (IF) signal. This IF signal is then processed by a mixer (247), which includes a local oscillator (LO) and a mixer core. The output of the mixer is a radio frequency (RF) signal, labeled as 'f_{RF}' (242). The system also includes a power amplifier (PA) (254) and a duplexer (250) connected to an antenna (252).</p> <p>Figure 2</p> <p>See, e.g., Rofougaran at Figure 2.</p> <p>FIG. 1 is a diagram showing a portion of a first non-limiting exemplary communication system 100, in accordance with various aspects of the present invention. The communication system (or device) may comprise characteristics of any of a variety of communication systems/devices (e.g., multimode</p>

Claim 7 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>wireless communication devices). For example and without limitation, the communication system may comprise characteristics of any of a variety of mobile wireless communication devices (e.g., cellular phones, paging devices, portable email devices, etc.). Also for example, the communication system may comprise characteristics of fixed communication systems or devices (e.g., network access points, base stations, satellites, wireless routers, set top boxes, etc.). Further for example, the communication system may comprise characteristics of a variety of electronic devices with wireless communication capability (e.g., televisions, music players, cameras, remote controls, personal digital assistants, handheld computers, gaming devices, etc.). Accordingly, the scope of various aspects of the present invention should not be limited by characteristics of particular communication systems or devices.</p> <p>The following discussion will, at times, refer to various communication modes. A multimode communication device may, for example, be adapted to communicate in a plurality of such communication modes. For the following discussion, a communication mode may generally be considered to coincide with communication utilizing a particular communication protocol or standard. A non-limiting list of exemplary communication protocols includes various cellular communication protocols (e.g., GSM, GPRS, EDGE, CDMA, WCDMA, TDMA, PDC, etc.), various wireless networking protocols or standards, including WLAN, WMAN, WPAN and WWAN (e.g., IEEE 802.11, Bluetooth, IEEE 802.15, UWB, IEEE 802.16, IEEE 802.20, Zigbee, any WiFi protocol, etc.), various television communication standards, etc. The scope of various aspects of the present invention should not be limited by characteristics of particular communication modes or protocols, whether standard or proprietary.</p> <p>The exemplary communication system 100 may comprise at least a first input 101 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to any of the previously mentioned communication protocols.</p> <p>The exemplary communication system 100 may also comprise at least a second input 102 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a</p>

Claim 7 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>second communication protocol (e.g., a second communication protocol different from the first communication protocol discussed above). For example and without limitation, the second baseband signal may correspond to any of the previously mentioned communication protocols. The first baseband signal and the second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of the communication system 100. For example, such modules may generate the first and second baseband signals independently (e.g., corresponding to independent respective communications). Alternatively, for example, such modules may generate the first and second baseband signals in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first and second baseband signals for a single communication).</p> <p>The exemplary communication system 100 may additionally comprise a spectral placement module 110 that is adapted to spectrally shift the first baseband signal (i.e., shift the frequency spectrum of the first baseband signal). In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to spectrally shift the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with the second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to implement a frequency-hopping scheme with the first baseband signal. For example, in a scenario, where there are one or more frequency bands (e.g., a second frequency space) associated with the second baseband signal, the spectral placement module 110 may be adapted to shift the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p><i>See, e.g., Rofougaran at 2:38-3:58.</i></p>

Claim 7 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>The exemplary communication system 100 may also comprise a second spectral placement module 120. Such a second spectral placement module 120 may, for example, share any or all characteristics with the spectral placement module 110 discussed previously. The incorporation of such a second spectral placement module 120 may, for example, provide spectral shifting flexibility. For example, in such an exemplary configuration, either or both of the first and second baseband signals may be spectrally shifted to substantially distinct frequency spaces. Also for example, in such an exemplary configuration, either or both of the first and second baseband signals may be frequency hopped. Note that though the second spectral placement module 120 is illustrated separate from the first spectral placement module 110, the second spectral placement module 120 may share any or all hardware and/or software components with the spectral placement module 110.</p> <p>The exemplary communication system 100 may further comprise a signal combiner 130 that is adapted to generate a composite signal comprising various input signals to the signal combiner 130. For example, the composite signal may simultaneously (i.e., at an instant in time) comprise components associated with various input signals. Note that such simultaneity need not always be present. For example, at a first instant in time, the signal output from the signal combiner 130 might comprise a plurality of components associated with a plurality of respective input signals, at a second instant in time, the signal output from the signal combiner 130 might comprise a single component associated with a single respective input signal, and at a third instant in time, the signal output from the signal combiner 130 might comprise no components.</p> <p>In a first non-limiting exemplary scenario, the signal combiner 130 may receive a first signal that is based on the first baseband signal (e.g., associated with a first communication protocol). Also, the signal combiner 130 may receive a second signal that is based on the second baseband signal (e.g., associated with a second communication protocol). In such a scenario, the signal combiner 130 may combine the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the first baseband signal and a second signal component based on the second baseband signal. In such a scenario, for example where the frequency spectra of the first and second baseband signals do not overlap, the first and second baseband signals might not be spectrally shifted prior to combining by the signal combiner 130. In such a scenario, the spectral placement module 110 (and optionally, the second spectral placement</p>

Claim 7 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>module 120) may receive a control signal indicating whether or not to perform spectral shifting and/or to what degree spectral shifting should be implemented.</p> <p><i>See, e.g., Rofougaran at 4:16-67.</i></p> <p>Various components of the exemplary communication system 100 (and other communication systems illustrated and discussed herein) may be implemented in analog and/or digital circuitry. To illustrate this, the exemplary communication system 100 is not shown with analog-to-digital converters (ADCs) or digital-to-analog converters (DACs). FIGS. 4-6, to be discussed later, show various non-limiting exemplary configurations including such converters.</p> <p>FIG. 2 is a diagram showing a portion of a second non-limiting exemplary communication system 200, in accordance with various aspects of the present invention. The communication system 200 may, for example and without limitation, share any or all characteristics with the communication system 100 illustrated in FIG. 1 and discussed previously.</p> <p>The exemplary communication system 200 may comprise at least a first input 201 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to the Bluetooth communication protocol. FIG. 2 shows an exemplary frequency spectrum 203 associated with the first baseband signal.</p> <p>The exemplary communication system 200 may also comprise at least a second input 202 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first communication protocol discussed above). For example and without limitation, the first baseband signal may correspond to an IEEE 802.11 communication protocol (e.g., IEEE 802.11(b) or IEEE 802.11(g)). FIG. 2 shows an exemplary frequency spectrum 204 associated with the second baseband signal.</p>

Claim 7 of the '802 Patent	Prior Art Reference – Rofougaran
	<p><i>See, e.g., Rofougaran at 5:64-6:31.</i></p> <p>In a non-limiting exemplary configuration illustrated in FIG. 2, the signal combiner 230 receives a first signal from the spectral placement module 210 that is based on the spectrally shifted first baseband signal. Also, the signal combiner 230 receives a second signal that is based on the second baseband signal. In such a configuration, the signal combiner 230 combines the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the spectrally shifted first baseband signal and a second signal component based on the second baseband signal (e.g., not spectrally shifted).</p> <p>FIG. 2 shows an exemplary frequency spectrum 231 associated with the composite signal formed by the signal combiner 230. The spectrum 231 comprises a first portion 233 corresponding to the first signal component, and a second portion 232 corresponding to the second signal component. Note that the first portion 233 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 232.</p> <p>The exemplary communication system 200 may also comprise an upconverter 240 adapted to upconvert a signal (e.g., the composite signal from the signal combiner 230) for transmission. The upconverter 240 may, for example and without limitation, share any or all characteristics with the upconverter 140 discussed previously.</p> <p>The upconverter 240 may, for example, comprise a mixer 247, a local oscillator 246 and one or more filters 248. The mixer 247 may, for example, receive the composite signal from the signal combiner 230 and an RF mixing signal at frequency fRF from a local oscillator 246. The upconverter 240 may, for example, filter the upconverted signal from the mixer 247 with one or more filters 248. The output of the upconverter 240 may, for example, comprise a signal indicative of the composite signal spectrally shifted to an RF frequency.</p> <p>FIG. 2 shows an exemplary frequency spectrum 241 associated with the RF signal formed by the upconverter 240. The frequency spectrum 241 comprises a first portion 243 corresponding to the first signal component and a second portion 242 corresponding to the second signal component. Note that</p>

Claim 7 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>the first portion 243 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 242. Also note that the first portion 243 and second portion 242 might be formed with a first mirror portion 244 and second mirror portion 245, respectively. Note that a mirror portion may either be removed or may be kept for later processing. The exemplary communication system 200 may further comprise a RF transmission stage 250 adapted to transmit an RF signal. The RF transmission stage 250 may, for example and without limitation, share any or all characteristics with the RF transmission stage 150 discussed previously. Such an RF signal may, for example, be associated with the composite signal output from the signal combiner 230 and upconverted by the upconverter 240. The RF transmission stage 250 may, for example and without limitation, comprise a power amplifier 252, antenna 254 and other components generally associated with RF signal transmission.</p> <p><i>See, e.g., Rofougaran at 6:66-7:57.</i></p> <p>For example, the spectral placement module 510, optional second spectral placement module 520 and signal combiner 530 may operate in the analog domain. The first digital-to-analog converter 592 may convert the first baseband signal to the analog domain for processing by the spectral placement module 510. The second digital-to-analog converter 594 may convert the second baseband signal to the analog domain for processing by the second spectral placement module 520 or signal combiner 530. The signal combiner 530 then combines signals in the analog domain to generate an analog composite signal, which is then upconverted and transmitted by the upconverter 540 and RF transmission stage 550, respectively.</p> <p><i>See, e.g., Rofougaran at 9:30-41.</i></p> <p>FIG. 7 is a diagram showing a portion of a seventh non-limiting exemplary communication system 700, in accordance with various aspects of the present invention. The exemplary communication system 700 may, for example and without limitation, share any or all characteristics with the exemplary systems 100-600 illustrated in FIGS. 1-6 and discussed previously.</p>

Claim 7 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>The exemplary communication system 700 may comprise a first mixer 744 that receives a spectrally shifted first baseband signal from the spectral placement module 710 and a first RF mixing signal (e.g., a 2.446 GHz signal generally associated with the Bluetooth communication protocol) from a first local oscillator 742. The exemplary communication system 700 may also comprise a second mixer 748 that receives a second baseband signal (or a spectrally shifted second baseband signal) and a second RF mixing signal (e.g., a 2.486 GHz signal generally associated with the IEEE 802.11(g) communication protocol) from a second local oscillator 746.</p> <p>The exemplary communication system 700 may comprise an RF signal combiner 730 that is adapted to combine input RF signals. The RF signal combiner 730 may, for example, receive and combine the output signals from the first mixer 744 and second mixer 748 to generate an RF composite signal. The exemplary communication system 700 may also comprise a RF transmission stage 750 that receives the RF composite signal from the RF signal combiner 730 and transmit the signal.</p> <p><i>See, e.g., Rofougaran at 10:18-43.</i></p> <p>The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 810 comprises receiving the first baseband signal, step 810 may comprise receiving the first baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The first baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 810 may, for example, comprise generating the first baseband signal independently (e.g., corresponding to an independent communication). Step 810 may alternatively, for example, comprise generating the first baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first baseband signal and other baseband signals for a single communication).</p> <p>The exemplary method 800 may, at step 820, comprise spectrally placing (or shifting) the first baseband signal (e.g., received at step 810). Step 820 may, for example and without limitation, share</p>

Claim 7 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>any or all functional characteristics with the spectral placement modules 110-710 of the exemplary systems 100-700 illustrated in FIGS. 1-7 and discussed previously.</p> <p>Step 820 may, for example, comprise spectrally shifting the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with a second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, step 820 may comprise implementing a frequency-hopping scheme with the first baseband signal. For example, in a scenario where there are one or more frequency bands (e.g., a second frequency space) associated with a second baseband signal, step 820 may comprise spectrally shifting the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p>In another non-limiting exemplary scenario, spectrally shifting the first baseband signal may result in the production of a spectral image (e.g., frequency content mirrored about a mixing frequency utilized to spectrally shift the first baseband signal). In such a scenario, step 820 may comprise accepting or rejecting the image.</p> <p>In a scenario where an image is rejected, step 820 may comprise rejecting the image in any of a variety of manners. For example and without limitation, step 820 may comprise performing image reject mixing to spectrally shift the first baseband signal. Such image reject mixing generally comprises spectrally shifting a signal and rejecting an image associated with the spectrally shifted signal. Also for example, step 820 may comprise filtering out an unwanted image. The scope of various aspects of the present invention should not be limited by the utilization of image rejection or by any particular manner of performing such image rejection.</p> <p>The exemplary method 800 may, at step 830, comprise generating and/or receiving a second baseband signal corresponding to a second communication protocol (e.g., different from the first</p>

Claim 7 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>communication protocol). Step 830 may, for example and without limitation, share any or all functional characteristics with the second input 102 of the exemplary system 100 illustrated in FIG. 1 and discussed previously.</p> <p>The second baseband signal may, for example, correspond to a second communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 830 comprises receiving the second baseband signal, step 830 may comprise receiving the second baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 830 may, for example, comprise generating the second baseband signal independently (e.g., corresponding to a communication independent of a communication associated with the first baseband signal). Step 830 may alternatively, for example, comprise generating the second baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the second baseband signal and the first baseband signal for a single communication).</p> <p><i>See, e.g., Rofougaran at 11:53-13:4.</i></p> <p>Furthermore, this claim element is obvious in light of Rofougaran itself, when combined with any of the other references as charted for this claim element in Exs. A-1–A-31, First Supplemental Ex. A-Obviousness Chart, and/or when combined with the knowledge of one of ordinary skill in the art. Motivations to combine may come from the knowledge of the person of ordinary skill themselves, or from the known problems and predictable solutions as embodied in these references. Further motivations to combine references and additional details may be found in the Cover Pleading and First Supplemental Ex. A-Obviousness Chart.</p>

Claim 8 of the '802 Patent	Prior Art Reference – Rofougaran
[8.1] The method of claim 1	Rofougaran discloses all the elements of claim 1 for all the reasons provided above.

Claim 8 of the '802 Patent	Prior Art Reference – Rofougaran
[8.2] wherein the first information and the second information are from the same data stream.	<p>Rofougaran discloses “wherein the first information and the second information are from the same data stream.” See, e.g.:</p> <p>FIG. 1 is a diagram showing a portion of a first non-limiting exemplary communication system 100, in accordance with various aspects of the present invention. The communication system (or device) may comprise characteristics of any of a variety of communication systems/devices (e.g., multimode wireless communication devices). For example and without limitation, the communication system may comprise characteristics of any of a variety of mobile wireless communication devices (e.g., cellular phones, paging devices, portable email devices, etc.). Also for example, the communication system may comprise characteristics of fixed communication systems or devices (e.g., network access points, base stations, satellites, wireless routers, set top boxes, etc.). Further for example, the communication system may comprise characteristics of a variety of electronic devices with wireless communication capability (e.g., televisions, music players, cameras, remote controls, personal digital assistants, handheld computers, gaming devices, etc.). Accordingly, the scope of various aspects of the present invention should not be limited by characteristics of particular communication systems or devices.</p> <p>The following discussion will, at times, refer to various communication modes. A multimode communication device may, for example, be adapted to communicate in a plurality of such communication modes. For the following discussion, a communication mode may generally be considered to coincide with communication utilizing a particular communication protocol or standard. A non-limiting list of exemplary communication protocols includes various cellular communication protocols (e.g., GSM, GPRS, EDGE, CDMA, WCDMA, TDMA, PDC, etc.), various wireless networking protocols or standards, including WLAN, WMAN, WPAN and WWAN (e.g., IEEE 802.11, Bluetooth, IEEE 802.15, UWB, IEEE 802.16, IEEE 802.20, Zigbee, any WiFi protocol, etc.), various television communication standards, etc. The scope of various aspects of the present invention should not be limited by characteristics of particular communication modes or protocols, whether standard or proprietary.</p> <p>The exemplary communication system 100 may comprise at least a first input 101 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first</p>

Claim 8 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to any of the previously mentioned communication protocols.</p> <p>The exemplary communication system 100 may also comprise at least a second input 102 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first communication protocol discussed above). For example and without limitation, the second baseband signal may correspond to any of the previously mentioned communication protocols.</p> <p>The first baseband signal and the second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of the communication system 100. For example, such modules may generate the first and second baseband signals independently (e.g., corresponding to independent respective communications). Alternatively, for example, such modules may generate the first and second baseband signals in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first and second baseband signals for a single communication).</p> <p>The exemplary communication system 100 may additionally comprise a spectral placement module 110 that is adapted to spectrally shift the first baseband signal (i.e., shift the frequency spectrum of the first baseband signal). In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to spectrally shift the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with the second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to implement a frequency-hopping scheme with the first baseband signal. For example, in a scenario, where there are one or more frequency bands (e.g., a second frequency space) associated with the second baseband signal, the spectral placement module 110 may be adapted to shift the first baseband</p>

Claim 8 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p><i>See, e.g.,</i> Rofougaran at 2:38-3:58.</p> <p>The exemplary communication system 100 may also comprise a second spectral placement module 120. Such a second spectral placement module 120 may, for example, share any or all characteristics with the spectral placement module 110 discussed previously. The incorporation of such a second spectral placement module 120 may, for example, provide spectral shifting flexibility. For example, in such an exemplary configuration, either or both of the first and second baseband signals may be spectrally shifted to substantially distinct frequency spaces. Also for example, in such an exemplary configuration, either or both of the first and second baseband signals may be frequency hopped. Note that though the second spectral placement module 120 is illustrated separate from the first spectral placement module 110, the second spectral placement module 120 may share any or all hardware and/or software components with the spectral placement module 110.</p> <p>The exemplary communication system 100 may further comprise a signal combiner 130 that is adapted to generate a composite signal comprising various input signals to the signal combiner 130. For example, the composite signal may simultaneously (i.e., at an instant in time) comprise components associated with various input signals. Note that such simultaneity need not always be present. For example, at a first instant in time, the signal output from the signal combiner 130 might comprise a plurality of components associated with a plurality of respective input signals, at a second instant in time, the signal output from the signal combiner 130 might comprise a single component associated with a single respective input signal, and at a third instant in time, the signal output from the signal combiner 130 might comprise no components.</p> <p>In a first non-limiting exemplary scenario, the signal combiner 130 may receive a first signal that is based on the first baseband signal (e.g., associated with a first communication protocol). Also, the signal combiner 130 may receive a second signal that is based on the second baseband signal (e.g., associated with a second communication protocol). In such a scenario, the signal combiner 130 may combine the first and second signals to generate a composite signal, where the composite signal</p>

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	<p>simultaneously comprises a first signal component based on the first baseband signal and a second signal component based on the second baseband signal. In such a scenario, for example where the frequency spectra of the first and second baseband signals do not overlap, the first and second baseband signals might not be spectrally shifted prior to combining by the signal combiner 130. In such a scenario, the spectral placement module 110 (and optionally, the second spectral placement module 120) may receive a control signal indicating whether or not to perform spectral shifting and/or to what degree spectral shifting should be implemented.</p> <p><i>See, e.g., Rofougaran at 4:16-67.</i></p> <p>Various components of the exemplary communication system 100 (and other communication systems illustrated and discussed herein) may be implemented in analog and/or digital circuitry. To illustrate this, the exemplary communication system 100 is not shown with analog-to-digital converters (ADCs) or digital-to-analog converters (DACs). FIGS. 4-6, to be discussed later, show various non-limiting exemplary configurations including such converters.</p> <p>FIG. 2 is a diagram showing a portion of a second non-limiting exemplary communication system 200, in accordance with various aspects of the present invention. The communication system 200 may, for example and without limitation, share any or all characteristics with the communication system 100 illustrated in FIG. 1 and discussed previously.</p> <p>The exemplary communication system 200 may comprise at least a first input 201 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to the Bluetooth communication protocol. FIG. 2 shows an exemplary frequency spectrum 203 associated with the first baseband signal.</p> <p>The exemplary communication system 200 may also comprise at least a second input 202 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first</p>

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	<p>communication protocol discussed above). For example and without limitation, the first baseband signal may correspond to an IEEE 802.11 communication protocol (e.g., IEEE 802.11(b) or IEEE 802.11(g)). FIG. 2 shows an exemplary frequency spectrum 204 associated with the second baseband signal.</p> <p><i>See, e.g., Rofougaran at 5:64-6:31.</i></p> <p>In a non-limiting exemplary configuration illustrated in FIG. 2, the signal combiner 230 receives a first signal from the spectral placement module 210 that is based on the spectrally shifted first baseband signal. Also, the signal combiner 230 receives a second signal that is based on the second baseband signal. In such a configuration, the signal combiner 230 combines the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the spectrally shifted first baseband signal and a second signal component based on the second baseband signal (e.g., not spectrally shifted).</p> <p>FIG. 2 shows an exemplary frequency spectrum 231 associated with the composite signal formed by the signal combiner 230. The spectrum 231 comprises a first portion 233 corresponding to the first signal component, and a second portion 232 corresponding to the second signal component. Note that the first portion 233 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 232.</p> <p>The exemplary communication system 200 may also comprise an upconverter 240 adapted to upconvert a signal (e.g., the composite signal from the signal combiner 230) for transmission. The upconverter 240 may, for example and without limitation, share any or all characteristics with the upconverter 140 discussed previously.</p> <p>The upconverter 240 may, for example, comprise a mixer 247, a local oscillator 246 and one or more filters 248. The mixer 247 may, for example, receive the composite signal from the signal combiner 230 and an RF mixing signal at frequency fRF from a local oscillator 246. The upconverter 240 may, for example, filter the upconverted signal from the mixer 247 with one or more filters 248. The</p>

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	<p>output of the upconverter 240 may, for example, comprise a signal indicative of the composite signal spectrally shifted to an RF frequency.</p> <p>FIG. 2 shows an exemplary frequency spectrum 241 associated with the RF signal formed by the upconverter 240. The frequency spectrum 241 comprises a first portion 243 corresponding to the first signal component and a second portion 242 corresponding to the second signal component. Note that the first portion 243 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 242. Also note that the first portion 243 and second portion 242 might be formed with a first mirror portion 244 and second mirror portion 245, respectively. Note that a mirror portion may either be removed or may be kept for later processing. The exemplary communication system 200 may further comprise a RF transmission stage 250 adapted to transmit an RF signal. The RF transmission stage 250 may, for example and without limitation, share any or all characteristics with the RF transmission stage 150 discussed previously. Such an RF signal may, for example, be associated with the composite signal output from the signal combiner 230 and upconverted by the upconverter 240. The RF transmission stage 250 may, for example and without limitation, comprise a power amplifier 252, antenna 254 and other components generally associated with RF signal transmission.</p> <p><i>See, e.g., Rofougaran at 6:66-7:57.</i></p> <p>For example, the spectral placement module 510, optional second spectral placement module 520 and signal combiner 530 may operate in the analog domain. The first digital-to-analog converter 592 may convert the first baseband signal to the analog domain for processing by the spectral placement module 510. The second digital-to-analog converter 594 may convert the second baseband signal to the analog domain for processing by the second spectral placement module 520 or signal combiner 530. The signal combiner 530 then combines signals in the analog domain to generate an analog composite signal, which is then upconverted and transmitted by the upconverter 540 and RF transmission stage 550, respectively.</p> <p><i>See, e.g., Rofougaran at 9:30-41.</i></p>

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	<p>FIG. 7 is a diagram showing a portion of a seventh non-limiting exemplary communication system 700, in accordance with various aspects of the present invention. The exemplary communication system 700 may, for example and without limitation, share any or all characteristics with the exemplary systems 100-600 illustrated in FIGS. 1-6 and discussed previously.</p> <p>The exemplary communication system 700 may comprise a first mixer 744 that receives a spectrally shifted first baseband signal from the spectral placement module 710 and a first RF mixing signal (e.g., a 2.446 GHz signal generally associated with the Bluetooth communication protocol) from a first local oscillator 742. The exemplary communication system 700 may also comprise a second mixer 748 that receives a second baseband signal (or a spectrally shifted second baseband signal) and a second RF mixing signal (e.g., a 2.486 GHz signal generally associated with the IEEE 802.11(g) communication protocol) from a second local oscillator 746.</p> <p>The exemplary communication system 700 may comprise an RF signal combiner 730 that is adapted to combine input RF signals. The RF signal combiner 730 may, for example, receive and combine the output signals from the first mixer 744 and second mixer 748 to generate an RF composite signal. The exemplary communication system 700 may also comprise a RF transmission stage 750 that receives the RF composite signal from the RF signal combiner 730 and transmit the signal.</p> <p><i>See, e.g., Rofougaran at 10:18-43.</i></p> <p>The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 810 comprises receiving the first baseband signal, step 810 may comprise receiving the first baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The first baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 810 may, for example, comprise generating the first baseband signal independently (e.g., corresponding to an independent communication). Step 810 may alternatively, for example, comprise generating the first baseband signal in a dependent manner (e.g., coordinating independent respective</p>

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	<p>communications or utilizing both the first baseband signal and other baseband signals for a single communication).</p> <p>The exemplary method 800 may, at step 820, comprise spectrally placing (or shifting) the first baseband signal (e.g., received at step 810). Step 820 may, for example and without limitation, share any or all functional characteristics with the spectral placement modules 110-710 of the exemplary systems 100-700 illustrated in FIGS. 1-7 and discussed previously.</p> <p>Step 820 may, for example, comprise spectrally shifting the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with a second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, step 820 may comprise implementing a frequency-hopping scheme with the first baseband signal. For example, in a scenario where there are one or more frequency bands (e.g., a second frequency space) associated with a second baseband signal, step 820 may comprise spectrally shifting the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p>In another non-limiting exemplary scenario, spectrally shifting the first baseband signal may result in the production of a spectral image (e.g., frequency content mirrored about a mixing frequency utilized to spectrally shift the first baseband signal). In such a scenario, step 820 may comprise accepting or rejecting the image.</p> <p>In a scenario where an image is rejected, step 820 may comprise rejecting the image in any of a variety of manners. For example and without limitation, step 820 may comprise performing image reject mixing to spectrally shift the first baseband signal. Such image reject mixing generally comprises spectrally shifting a signal and rejecting an image associated with the spectrally shifted signal. Also for example, step 820 may comprise filtering out an unwanted image. The scope of</p>

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	<p>various aspects of the present invention should not be limited by the utilization of image rejection or by any particular manner of performing such image rejection.</p> <p>The exemplary method 800 may, at step 830, comprise generating and/or receiving a second baseband signal corresponding to a second communication protocol (e.g., different from the first communication protocol). Step 830 may, for example and without limitation, share any or all functional characteristics with the second input 102 of the exemplary system 100 illustrated in FIG. 1 and discussed previously.</p> <p>The second baseband signal may, for example, correspond to a second communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 830 comprises receiving the second baseband signal, step 830 may comprise receiving the second baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 830 may, for example, comprise generating the second baseband signal independently (e.g., corresponding to a communication independent of a communication associated with the first baseband signal). Step 830 may alternatively, for example, comprise generating the second baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the second baseband signal and the first baseband signal for a single communication).</p> <p><i>See, e.g., Rofougaran at 11:53-13:4.</i></p> <p>Furthermore, this claim element is obvious in light of Rofougaran itself, when combined with any of the other references as charted for this claim element in Exs. A-1–A-31, First Supplemental Ex. A–Obviousness Chart, and/or when combined with the knowledge of one of ordinary skill in the art. Motivations to combine may come from the knowledge of the person of ordinary skill themselves, or from the known problems and predictable solutions as embodied in these references. Further motivations to combine references and additional details may be found in the Cover Pleading and First Supplemental Ex. A–Obviousness Chart.</p>

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[9.1] The method of claim 1	Rofougaran discloses all the elements of claim 1 for all the reasons provided above.
[9.2] wherein first information and second information comprise a plurality of OFDM symbols, wherein a first symbol is transmitted during a first time slot across the first frequency range and a second symbol is transmitted during the first time slot across the second frequency range, and wherein a third symbol is transmitted during a second time slot across the first frequency range and a fourth symbol is transmitted during the second time slot across a second frequency range.	<p>Rofougaran discloses “wherein first information and second information comprise a plurality of OFDM symbols, wherein a first symbol is transmitted during a first time slot across the first frequency range and a second symbol is transmitted during the first time slot across the second frequency range, and wherein a third symbol is transmitted during a second time slot across the first frequency range and a fourth symbol is transmitted during the second time slot across a second frequency range.” See, e.g.:</p> <p>FIG. 1 is a diagram showing a portion of a first non-limiting exemplary communication system 100, in accordance with various aspects of the present invention. The communication system (or device) may comprise characteristics of any of a variety of communication systems/devices (e.g., multimode wireless communication devices). For example and without limitation, the communication system may comprise characteristics of any of a variety of mobile wireless communication devices (e.g., cellular phones, paging devices, portable email devices, etc.). Also for example, the communication system may comprise characteristics of fixed communication systems or devices (e.g., network access points, base stations, satellites, wireless routers, set top boxes, etc.). Further for example, the communication system may comprise characteristics of a variety of electronic devices with wireless communication capability (e.g., televisions, music players, cameras, remote controls, personal digital assistants, handheld computers, gaming devices, etc.). Accordingly, the scope of various aspects of the present invention should not be limited by characteristics of particular communication systems or devices.</p> <p>The following discussion will, at times, refer to various communication modes. A multimode communication device may, for example, be adapted to communicate in a plurality of such communication modes. For the following discussion, a communication mode may generally be considered to coincide with communication utilizing a particular communication protocol or standard. A non-limiting list of exemplary communication protocols includes various cellular communication protocols (e.g., GSM, GPRS, EDGE, CDMA, WCDMA, TDMA, PDC, etc.), various wireless networking protocols or standards, including WLAN, WMAN, WPAN and WWAN (e.g.,</p>

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	<p>IEEE 802.11, Bluetooth, IEEE 802.15, UWB, IEEE 802.16, IEEE 802.20, Zigbee, any WiFi protocol, etc.), various television communication standards, etc. The scope of various aspects of the present invention should not be limited by characteristics of particular communication modes or protocols, whether standard or proprietary.</p> <p>The exemplary communication system 100 may comprise at least a first input 101 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to any of the previously mentioned communication protocols.</p> <p>The exemplary communication system 100 may also comprise at least a second input 102 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first communication protocol discussed above). For example and without limitation, the second baseband signal may correspond to any of the previously mentioned communication protocols.</p> <p>The first baseband signal and the second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of the communication system 100. For example, such modules may generate the first and second baseband signals independently (e.g., corresponding to independent respective communications). Alternatively, for example, such modules may generate the first and second baseband signals in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first and second baseband signals for a single communication).</p> <p>The exemplary communication system 100 may additionally comprise a spectral placement module 110 that is adapted to spectrally shift the first baseband signal (i.e., shift the frequency spectrum of the first baseband signal). In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to spectrally shift the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with the second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the</p>

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	<p>second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to implement a frequency-hopping scheme with the first baseband signal. For example, in a scenario, where there are one or more frequency bands (e.g., a second frequency space) associated with the second baseband signal, the spectral placement module 110 may be adapted to shift the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p><i>See, e.g., Rofougaran at 2:38-3:58.</i></p> <p>The exemplary communication system 100 may also comprise a second spectral placement module 120. Such a second spectral placement module 120 may, for example, share any or all characteristics with the spectral placement module 110 discussed previously. The incorporation of such a second spectral placement module 120 may, for example, provide spectral shifting flexibility. For example, in such an exemplary configuration, either or both of the first and second baseband signals may be spectrally shifted to substantially distinct frequency spaces. Also for example, in such an exemplary configuration, either or both of the first and second baseband signals may be frequency hopped. Note that though the second spectral placement module 120 is illustrated separate from the first spectral placement module 110, the second spectral placement module 120 may share any or all hardware and/or software components with the spectral placement module 110.</p> <p>The exemplary communication system 100 may further comprise a signal combiner 130 that is adapted to generate a composite signal comprising various input signals to the signal combiner 130. For example, the composite signal may simultaneously (i.e., at an instant in time) comprise components associated with various input signals. Note that such simultaneity need not always be present. For example, at a first instant in time, the signal output from the signal combiner 130 might comprise a plurality of components associated with a plurality of respective input signals, at a second instant in time, the signal output from the signal combiner 130 might comprise a single component</p>

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	<p>associated with a single respective input signal, and at a third instant in time, the signal output from the signal combiner 130 might comprise no components.</p> <p>In a first non-limiting exemplary scenario, the signal combiner 130 may receive a first signal that is based on the first baseband signal (e.g., associated with a first communication protocol). Also, the signal combiner 130 may receive a second signal that is based on the second baseband signal (e.g., associated with a second communication protocol). In such a scenario, the signal combiner 130 may combine the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the first baseband signal and a second signal component based on the second baseband signal. In such a scenario, for example where the frequency spectra of the first and second baseband signals do not overlap, the first and second baseband signals might not be spectrally shifted prior to combining by the signal combiner 130. In such a scenario, the spectral placement module 110 (and optionally, the second spectral placement module 120) may receive a control signal indicating whether or not to perform spectral shifting and/or to what degree spectral shifting should be implemented.</p> <p><i>See, e.g., Rofougaran at 4:16-67.</i></p> <p>Various components of the exemplary communication system 100 (and other communication systems illustrated and discussed herein) may be implemented in analog and/or digital circuitry. To illustrate this, the exemplary communication system 100 is not shown with analog-to-digital converters (ADCs) or digital-to-analog converters (DACs). FIGS. 4-6, to be discussed later, show various non-limiting exemplary configurations including such converters.</p> <p>FIG. 2 is a diagram showing a portion of a second non-limiting exemplary communication system 200, in accordance with various aspects of the present invention. The communication system 200 may, for example and without limitation, share any or all characteristics with the communication system 100 illustrated in FIG. 1 and discussed previously.</p> <p>The exemplary communication system 200 may comprise at least a first input 201 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first</p>

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	<p>communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to the Bluetooth communication protocol. FIG. 2 shows an exemplary frequency spectrum 203 associated with the first baseband signal.</p> <p>The exemplary communication system 200 may also comprise at least a second input 202 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first communication protocol discussed above). For example and without limitation, the first baseband signal may correspond to an IEEE 802.11 communication protocol (e.g., IEEE 802.11(b) or IEEE 802.11(g)). FIG. 2 shows an exemplary frequency spectrum 204 associated with the second baseband signal.</p> <p><i>See, e.g., Rofougaran at 5:64-6:31.</i></p> <p>In a non-limiting exemplary configuration illustrated in FIG. 2, the signal combiner 230 receives a first signal from the spectral placement module 210 that is based on the spectrally shifted first baseband signal. Also, the signal combiner 230 receives a second signal that is based on the second baseband signal. In such a configuration, the signal combiner 230 combines the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the spectrally shifted first baseband signal and a second signal component based on the second baseband signal (e.g., not spectrally shifted).</p> <p>FIG. 2 shows an exemplary frequency spectrum 231 associated with the composite signal formed by the signal combiner 230. The spectrum 231 comprises a first portion 233 corresponding to the first signal component, and a second portion 232 corresponding to the second signal component. Note that the first portion 233 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 232.</p> <p>The exemplary communication system 200 may also comprise an upconverter 240 adapted to upconvert a signal (e.g., the composite signal from the signal combiner 230) for transmission. The</p>

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	<p>upconverter 240 may, for example and without limitation, share any or all characteristics with the upconverter 140 discussed previously.</p> <p>The upconverter 240 may, for example, comprise a mixer 247, a local oscillator 246 and one or more filters 248. The mixer 247 may, for example, receive the composite signal from the signal combiner 230 and an RF mixing signal at frequency fRF from a local oscillator 246. The upconverter 240 may, for example, filter the upconverted signal from the mixer 247 with one or more filters 248. The output of the upconverter 240 may, for example, comprise a signal indicative of the composite signal spectrally shifted to an RF frequency.</p> <p>FIG. 2 shows an exemplary frequency spectrum 241 associated with the RF signal formed by the upconverter 240. The frequency spectrum 241 comprises a first portion 243 corresponding to the first signal component and a second portion 242 corresponding to the second signal component. Note that the first portion 243 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 242. Also note that the first portion 243 and second portion 242 might be formed with a first mirror portion 244 and second mirror portion 245, respectively. Note that a mirror portion may either be removed or may be kept for later processing. The exemplary communication system 200 may further comprise a RF transmission stage 250 adapted to transmit an RF signal. The RF transmission stage 250 may, for example and without limitation, share any or all characteristics with the RF transmission stage 150 discussed previously. Such an RF signal may, for example, be associated with the composite signal output from the signal combiner 230 and upconverted by the upconverter 240. The RF transmission stage 250 may, for example and without limitation, comprise a power amplifier 252, antenna 254 and other components generally associated with RF signal transmission.</p> <p><i>See, e.g., Rofougaran at 6:66-7:57.</i></p> <p>For example, the spectral placement module 510, optional second spectral placement module 520 and signal combiner 530 may operate in the analog domain. The first digital-to-analog converter 592 may convert the first baseband signal to the analog domain for processing by the spectral placement module 510. The second digital-to-analog converter 594 may convert the second baseband signal to</p>

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	<p>the analog domain for processing by the second spectral placement module 520 or signal combiner 530. The signal combiner 530 then combines signals in the analog domain to generate an analog composite signal, which is then upconverted and transmitted by the upconverter 540 and RF transmission stage 550, respectively.</p> <p><i>See, e.g., Rofougaran at 9:30-41.</i></p> <p>FIG. 7 is a diagram showing a portion of a seventh non-limiting exemplary communication system 700, in accordance with various aspects of the present invention. The exemplary communication system 700 may, for example and without limitation, share any or all characteristics with the exemplary systems 100-600 illustrated in FIGS. 1-6 and discussed previously.</p> <p>The exemplary communication system 700 may comprise a first mixer 744 that receives a spectrally shifted first baseband signal from the spectral placement module 710 and a first RF mixing signal (e.g., a 2.446 GHz signal generally associated with the Bluetooth communication protocol) from a first local oscillator 742. The exemplary communication system 700 may also comprise a second mixer 748 that receives a second baseband signal (or a spectrally shifted second baseband signal) and a second RF mixing signal (e.g., a 2.486 GHz signal generally associated with the IEEE 802.11(g) communication protocol) from a second local oscillator 746.</p> <p>The exemplary communication system 700 may comprise an RF signal combiner 730 that is adapted to combine input RF signals. The RF signal combiner 730 may, for example, receive and combine the output signals from the first mixer 744 and second mixer 748 to generate an RF composite signal. The exemplary communication system 700 may also comprise a RF transmission stage 750 that receives the RF composite signal from the RF signal combiner 730 and transmit the signal.</p> <p><i>See, e.g., Rofougaran at 10:18-43.</i></p> <p>The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where</p>

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	<p>step 810 comprises receiving the first baseband signal, step 810 may comprise receiving the first baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The first baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 810 may, for example, comprise generating the first baseband signal independently (e.g., corresponding to an independent communication). Step 810 may alternatively, for example, comprise generating the first baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first baseband signal and other baseband signals for a single communication).</p> <p>The exemplary method 800 may, at step 820, comprise spectrally placing (or shifting) the first baseband signal (e.g., received at step 810). Step 820 may, for example and without limitation, share any or all functional characteristics with the spectral placement modules 110-710 of the exemplary systems 100-700 illustrated in FIGS. 1-7 and discussed previously.</p> <p>Step 820 may, for example, comprise spectrally shifting the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with a second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, step 820 may comprise implementing a frequency-hopping scheme with the first baseband signal. For example, in a scenario where there are one or more frequency bands (e.g., a second frequency space) associated with a second baseband signal, step 820 may comprise spectrally shifting the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p>In another non-limiting exemplary scenario, spectrally shifting the first baseband signal may result in the production of a spectral image (e.g., frequency content mirrored about a mixing frequency</p>

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	<p>utilized to spectrally shift the first baseband signal). In such a scenario, step 820 may comprise accepting or rejecting the image.</p> <p>In a scenario where an image is rejected, step 820 may comprise rejecting the image in any of a variety of manners. For example and without limitation, step 820 may comprise performing image reject mixing to spectrally shift the first baseband signal. Such image reject mixing generally comprises spectrally shifting a signal and rejecting an image associated with the spectrally shifted signal. Also for example, step 820 may comprise filtering out an unwanted image. The scope of various aspects of the present invention should not be limited by the utilization of image rejection or by any particular manner of performing such image rejection.</p> <p>The exemplary method 800 may, at step 830, comprise generating and/or receiving a second baseband signal corresponding to a second communication protocol (e.g., different from the first communication protocol). Step 830 may, for example and without limitation, share any or all functional characteristics with the second input 102 of the exemplary system 100 illustrated in FIG. 1 and discussed previously.</p> <p>The second baseband signal may, for example, correspond to a second communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 830 comprises receiving the second baseband signal, step 830 may comprise receiving the second baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 830 may, for example, comprise generating the second baseband signal independently (e.g., corresponding to a communication independent of a communication associated with the first baseband signal). Step 830 may alternatively, for example, comprise generating the second baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the second baseband signal and the first baseband signal for a single communication).</p> <p><i>See, e.g., Rofougaran at 11:53-13:4.</i></p>

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	<p>Furthermore, this claim element is obvious in light of Rofougaran itself, when combined with any of the other references as charted for this claim element in Exs. A-1–A-31, First Supplemental Ex. A-Obviousness Chart, and/or when combined with the knowledge of one of ordinary skill in the art. Motivations to combine may come from the knowledge of the person of ordinary skill themselves, or from the known problems and predictable solutions as embodied in these references. Further motivations to combine references and additional details may be found in the Cover Pleading and First Supplemental Ex. A-Obviousness Chart.</p>

Claim 10 of the '802 Patent	Prior Art Reference – Rofougaran
[10.1] A method of transmitting information in a wireless communication channel comprising:	<p>To the extent the preamble is limiting, Rofougaran discloses “A method of transmitting information in a wireless communication channel comprising.” See, e.g.:</p> <p>FIG. 1 is a diagram showing a portion of a first non-limiting exemplary communication system 100, in accordance with various aspects of the present invention. The communication system (or device) may comprise characteristics of any of a variety of communication systems/devices (e.g., multimode wireless communication devices). For example and without limitation, the communication system may comprise characteristics of any of a variety of mobile wireless communication devices (e.g., cellular phones, paging devices, portable email devices, etc.). Also for example, the communication system may comprise characteristics of fixed communication systems or devices (e.g., network access points, base stations, satellites, wireless routers, set top boxes, etc.). Further for example, the communication system may comprise characteristics of a variety of electronic devices with wireless communication capability (e.g., televisions, music players, cameras, remote controls, personal digital assistants, handheld computers, gaming devices, etc.). Accordingly, the scope of various aspects of the present invention should not be limited by characteristics of particular communication systems or devices.</p> <p>The following discussion will, at times, refer to various communication modes. A multimode communication device may, for example, be adapted to communicate in a plurality of such</p>

Claim 10 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>communication modes. For the following discussion, a communication mode may generally be considered to coincide with communication utilizing a particular communication protocol or standard. A non-limiting list of exemplary communication protocols includes various cellular communication protocols (e.g., GSM, GPRS, EDGE, CDMA, WCDMA, TDMA, PDC, etc.), various wireless networking protocols or standards, including WLAN, WMAN, WPAN and WWAN (e.g., IEEE 802.11, Bluetooth, IEEE 802.15, UWB, IEEE 802.16, IEEE 802.20, Zigbee, any WiFi protocol, etc.), various television communication standards, etc. The scope of various aspects of the present invention should not be limited by characteristics of particular communication modes or protocols, whether standard or proprietary.</p> <p><i>See, e.g.</i>, Rofougaran at 2:36-3:6.</p> <p>Furthermore, this claim element is obvious in light of Rofougaran itself, when combined with any of the other references as charted for this claim element in Exs. A-1–A-31, First Supplemental Ex. A-Obviousness Chart, and/or when combined with the knowledge of one of ordinary skill in the art. Motivations to combine may come from the knowledge of the person of ordinary skill themselves, or from the known problems and predictable solutions as embodied in these references. Further motivations to combine references and additional details may be found in the Cover Pleading and First Supplemental Ex. A-Obviousness Chart.</p>
[10.2] receiving a first digital signal comprising first data to be transmitted;	Rofougaran discloses “receiving a first digital signal comprising first data to be transmitted.” See, e.g.:

Claim 10 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>The diagram illustrates a signal processing system for spectral placement. It starts with two baseband signals: a First Baseband Signal (201) and a Second Baseband Signal (202). These signals are processed by a Spectral Placement Module (210), which generates three intermediate signals: 211, 212, and 213. Signal 211 is positioned at frequency $-f_s$, while 212 is at f_s. The Second Baseband Signal (202) is also processed by the Spectral Placement Module (210) to produce signal 204. Signals 211, 212, and 204 are combined at a Signal Combiner (230). The output of the Signal Combiner (247) is fed into a mixer (246), which also receives a Local Oscillator (LO) signal (246). The mixer's output is then processed by a filter (248) and a power amplifier (PA) (250). The PA's output signal (252) is transmitted through an antenna (250). The system also includes a low-frequency filter (231, 232, 233) and a high-frequency filter (241, 242, 243) positioned along the signal path.</p>

Figure 2

See, e.g., Rofougaran at Figure 2.

Claim 10 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>The diagram illustrates a signal processing chain for RF transmission. It begins with two baseband signals: the 1st Baseband Signal and the 2nd Baseband Signal. These signals are processed by two DACs (Digital-to-Analog Converters), labeled 592 and 594. The outputs of the DACs are fed into a Spectral Placement Module (510) and an optional second spectral placement module (520). The outputs from the modules are combined at a Signal Combiner (530). The combined signal then passes through an Upconverter (540) and an RF Xmit Stage (550) before being transmitted.</p>

Figure 5

See, e.g., Rofougaran at Figure 5.

Claim 10 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>The diagram illustrates a communication system architecture. It starts with two baseband signal inputs: a "First Baseband Signal" and a "Second Baseband Signal". The First Baseband Signal is processed by a "Spectral Placement Module" (710). This module is connected to a mixer (744), which also receives a local oscillator signal from "LO1" (e.g., 2.446 GHz). The output of the mixer is then sent to an "RF Signal Combiner" (730). The Second Baseband Signal is processed by an "Optional Second Spectral Placement Module" (720). This module is connected to a mixer (748), which also receives a local oscillator signal from "LO2" (e.g., 2.486 GHz). The output of the second mixer is also sent to the "RF Signal Combiner" (730). Finally, the "RF Signal Combiner" (730) feeds into an "RF Xmit Stage" (750), which transmits the combined signal.</p> <p>Figure 7</p> <p>See, e.g., Rofougaran at Figure 7.</p> <p>FIG. 1 is a diagram showing a portion of a first non-limiting exemplary communication system 100, in accordance with various aspects of the present invention. The communication system (or device) may comprise characteristics of any of a variety of communication systems/devices (e.g., multimode wireless communication devices). For example and without limitation, the communication system may comprise characteristics of any of a variety of mobile wireless communication devices (e.g.,</p>

Claim 10 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>cellular phones, paging devices, portable email devices, etc.). Also for example, the communication system may comprise characteristics of fixed communication systems or devices (e.g., network access points, base stations, satellites, wireless routers, set top boxes, etc.). Further for example, the communication system may comprise characteristics of a variety of electronic devices with wireless communication capability (e.g., televisions, music players, cameras, remote controls, personal digital assistants, handheld computers, gaming devices, etc.). Accordingly, the scope of various aspects of the present invention should not be limited by characteristics of particular communication systems or devices.</p> <p>The following discussion will, at times, refer to various communication modes. A multimode communication device may, for example, be adapted to communicate in a plurality of such communication modes. For the following discussion, a communication mode may generally be considered to coincide with communication utilizing a particular communication protocol or standard. A non-limiting list of exemplary communication protocols includes various cellular communication protocols (e.g., GSM, GPRS, EDGE, CDMA, WCDMA, TDMA, PDC, etc.), various wireless networking protocols or standards, including WLAN, WMAN, WPAN and WWAN (e.g., IEEE 802.11, Bluetooth, IEEE 802.15, UWB, IEEE 802.16, IEEE 802.20, Zigbee, any WiFi protocol, etc.), various television communication standards, etc. The scope of various aspects of the present invention should not be limited by characteristics of particular communication modes or protocols, whether standard or proprietary.</p> <p>The exemplary communication system 100 may comprise at least a first input 101 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to any of the previously mentioned communication protocols.</p> <p>The exemplary communication system 100 may also comprise at least a second input 102 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first</p>

Claim 10 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>communication protocol discussed above). For example and without limitation, the second baseband signal may correspond to any of the previously mentioned communication protocols. The first baseband signal and the second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of the communication system 100. For example, such modules may generate the first and second baseband signals independently (e.g., corresponding to independent respective communications). Alternatively, for example, such modules may generate the first and second baseband signals in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first and second baseband signals for a single communication).</p> <p>The exemplary communication system 100 may additionally comprise a spectral placement module 110 that is adapted to spectrally shift the first baseband signal (i.e., shift the frequency spectrum of the first baseband signal). In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to spectrally shift the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with the second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to implement a frequency-hopping scheme with the first baseband signal. For example, in a scenario, where there are one or more frequency bands (e.g., a second frequency space) associated with the second baseband signal, the spectral placement module 110 may be adapted to shift the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p><i>See, e.g., Rofougaran at 2:38-3:58.</i></p> <p>The exemplary communication system 100 may also comprise a second spectral placement module 120. Such a second spectral placement module 120 may, for example, share any or all characteristics</p>

Claim 10 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>with the spectral placement module 110 discussed previously. The incorporation of such a second spectral placement module 120 may, for example, provide spectral shifting flexibility. For example, in such an exemplary configuration, either or both of the first and second baseband signals may be spectrally shifted to substantially distinct frequency spaces. Also for example, in such an exemplary configuration, either or both of the first and second baseband signals may be frequency hopped. Note that though the second spectral placement module 120 is illustrated separate from the first spectral placement module 110, the second spectral placement module 120 may share any or all hardware and/or software components with the spectral placement module 110.</p> <p>The exemplary communication system 100 may further comprise a signal combiner 130 that is adapted to generate a composite signal comprising various input signals to the signal combiner 130. For example, the composite signal may simultaneously (i.e., at an instant in time) comprise components associated with various input signals. Note that such simultaneity need not always be present. For example, at a first instant in time, the signal output from the signal combiner 130 might comprise a plurality of components associated with a plurality of respective input signals, at a second instant in time, the signal output from the signal combiner 130 might comprise a single component associated with a single respective input signal, and at a third instant in time, the signal output from the signal combiner 130 might comprise no components.</p> <p>In a first non-limiting exemplary scenario, the signal combiner 130 may receive a first signal that is based on the first baseband signal (e.g., associated with a first communication protocol). Also, the signal combiner 130 may receive a second signal that is based on the second baseband signal (e.g., associated with a second communication protocol). In such a scenario, the signal combiner 130 may combine the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the first baseband signal and a second signal component based on the second baseband signal. In such a scenario, for example where the frequency spectra of the first and second baseband signals do not overlap, the first and second baseband signals might not be spectrally shifted prior to combining by the signal combiner 130. In such a scenario, the spectral placement module 110 (and optionally, the second spectral placement module 120) may receive a control signal indicating whether or not to perform spectral shifting and/or to what degree spectral shifting should be implemented.</p>

Claim 10 of the '802 Patent	Prior Art Reference – Rofougaran
	<p><i>See, e.g.</i>, Rofougaran at 4:16-67.</p> <p>Various components of the exemplary communication system 100 (and other communication systems illustrated and discussed herein) may be implemented in analog and/or digital circuitry. To illustrate this, the exemplary communication system 100 is not shown with analog-to-digital converters (ADCs) or digital-to-analog converters (DACs). FIGS. 4-6, to be discussed later, show various non-limiting exemplary configurations including such converters.</p> <p>FIG. 2 is a diagram showing a portion of a second non-limiting exemplary communication system 200, in accordance with various aspects of the present invention. The communication system 200 may, for example and without limitation, share any or all characteristics with the communication system 100 illustrated in FIG. 1 and discussed previously.</p> <p>The exemplary communication system 200 may comprise at least a first input 201 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to the Bluetooth communication protocol. FIG. 2 shows an exemplary frequency spectrum 203 associated with the first baseband signal.</p> <p>The exemplary communication system 200 may also comprise at least a second input 202 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first communication protocol discussed above). For example and without limitation, the first baseband signal may correspond to an IEEE 802.11 communication protocol (e.g., IEEE 802.11(b) or IEEE 802.11(g)). FIG. 2 shows an exemplary frequency spectrum 204 associated with the second baseband signal.</p> <p><i>See, e.g.</i>, Rofougaran at 5:64-6:31.</p>

Claim 10 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>In a non-limiting exemplary configuration illustrated in FIG. 2, the signal combiner 230 receives a first signal from the spectral placement module 210 that is based on the spectrally shifted first baseband signal. Also, the signal combiner 230 receives a second signal that is based on the second baseband signal. In such a configuration, the signal combiner 230 combines the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the spectrally shifted first baseband signal and a second signal component based on the second baseband signal (e.g., not spectrally shifted).</p> <p>FIG. 2 shows an exemplary frequency spectrum 231 associated with the composite signal formed by the signal combiner 230. The spectrum 231 comprises a first portion 233 corresponding to the first signal component, and a second portion 232 corresponding to the second signal component. Note that the first portion 233 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 232.</p> <p>The exemplary communication system 200 may also comprise an upconverter 240 adapted to upconvert a signal (e.g., the composite signal from the signal combiner 230) for transmission. The upconverter 240 may, for example and without limitation, share any or all characteristics with the upconverter 140 discussed previously.</p> <p>The upconverter 240 may, for example, comprise a mixer 247, a local oscillator 246 and one or more filters 248. The mixer 247 may, for example, receive the composite signal from the signal combiner 230 and an RF mixing signal at frequency fRF from a local oscillator 246. The upconverter 240 may, for example, filter the upconverted signal from the mixer 247 with one or more filters 248. The output of the upconverter 240 may, for example, comprise a signal indicative of the composite signal spectrally shifted to an RF frequency.</p> <p>FIG. 2 shows an exemplary frequency spectrum 241 associated with the RF signal formed by the upconverter 240. The frequency spectrum 241 comprises a first portion 243 corresponding to the first signal component and a second portion 242 corresponding to the second signal component. Note that the first portion 243 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 242. Also note that the first portion 243 and</p>

Claim 10 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>second portion 242 might be formed with a first mirror portion 244 and second mirror portion 245, respectively. Note that a mirror portion may either be removed or may be kept for later processing. The exemplary communication system 200 may further comprise a RF transmission stage 250 adapted to transmit an RF signal. The RF transmission stage 250 may, for example and without limitation, share any or all characteristics with the RF transmission stage 150 discussed previously. Such an RF signal may, for example, be associated with the composite signal output from the signal combiner 230 and upconverted by the upconverter 240. The RF transmission stage 250 may, for example and without limitation, comprise a power amplifier 252, antenna 254 and other components generally associated with RF signal transmission.</p> <p><i>See, e.g., Rofougaran at 6:66-7:57.</i></p> <p>For example, the spectral placement module 510, optional second spectral placement module 520 and signal combiner 530 may operate in the analog domain. The first digital-to-analog converter 592 may convert the first baseband signal to the analog domain for processing by the spectral placement module 510. The second digital-to-analog converter 594 may convert the second baseband signal to the analog domain for processing by the second spectral placement module 520 or signal combiner 530. The signal combiner 530 then combines signals in the analog domain to generate an analog composite signal, which is then upconverted and transmitted by the upconverter 540 and RF transmission stage 550, respectively.</p> <p><i>See, e.g., Rofougaran at 9:30-41.</i></p> <p>FIG. 7 is a diagram showing a portion of a seventh non-limiting exemplary communication system 700, in accordance with various aspects of the present invention. The exemplary communication system 700 may, for example and without limitation, share any or all characteristics with the exemplary systems 100-600 illustrated in FIGS. 1-6 and discussed previously.</p> <p>The exemplary communication system 700 may comprise a first mixer 744 that receives a spectrally shifted first baseband signal from the spectral placement module 710 and a first RF mixing signal (e.g., a 2.446 GHz signal generally associated with the Bluetooth communication protocol) from a</p>

Claim 10 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>first local oscillator 742. The exemplary communication system 700 may also comprise a second mixer 748 that receives a second baseband signal (or a spectrally shifted second baseband signal) and a second RF mixing signal (e.g., a 2.486 GHz signal generally associated with the IEEE 802.11(g) communication protocol) from a second local oscillator 746.</p> <p>The exemplary communication system 700 may comprise an RF signal combiner 730 that is adapted to combine input RF signals. The RF signal combiner 730 may, for example, receive and combine the output signals from the first mixer 744 and second mixer 748 to generate an RF composite signal. The exemplary communication system 700 may also comprise a RF transmission stage 750 that receives the RF composite signal from the RF signal combiner 730 and transmit the signal.</p> <p><i>See, e.g.</i>, Rofougaran at 10:18-43.</p> <p>The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 810 comprises receiving the first baseband signal, step 810 may comprise receiving the first baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The first baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 810 may, for example, comprise generating the first baseband signal independently (e.g., corresponding to an independent communication). Step 810 may alternatively, for example, comprise generating the first baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first baseband signal and other baseband signals for a single communication).</p> <p>The exemplary method 800 may, at step 820, comprise spectrally placing (or shifting) the first baseband signal (e.g., received at step 810). Step 820 may, for example and without limitation, share any or all functional characteristics with the spectral placement modules 110-710 of the exemplary systems 100-700 illustrated in FIGS. 1-7 and discussed previously.</p>

Claim 10 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>Step 820 may, for example, comprise spectrally shifting the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with a second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, step 820 may comprise implementing a frequency-hopping scheme with the first baseband signal. For example, in a scenario where there are one or more frequency bands (e.g., a second frequency space) associated with a second baseband signal, step 820 may comprise spectrally shifting the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p>In another non-limiting exemplary scenario, spectrally shifting the first baseband signal may result in the production of a spectral image (e.g., frequency content mirrored about a mixing frequency utilized to spectrally shift the first baseband signal). In such a scenario, step 820 may comprise accepting or rejecting the image.</p> <p>In a scenario where an image is rejected, step 820 may comprise rejecting the image in any of a variety of manners. For example and without limitation, step 820 may comprise performing image reject mixing to spectrally shift the first baseband signal. Such image reject mixing generally comprises spectrally shifting a signal and rejecting an image associated with the spectrally shifted signal. Also for example, step 820 may comprise filtering out an unwanted image. The scope of various aspects of the present invention should not be limited by the utilization of image rejection or by any particular manner of performing such image rejection.</p> <p>The exemplary method 800 may, at step 830, comprise generating and/or receiving a second baseband signal corresponding to a second communication protocol (e.g., different from the first communication protocol). Step 830 may, for example and without limitation, share any or all functional characteristics with the second input 102 of the exemplary system 100 illustrated in FIG. 1 and discussed previously.</p>

Claim 10 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>The second baseband signal may, for example, correspond to a second communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 830 comprises receiving the second baseband signal, step 830 may comprise receiving the second baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 830 may, for example, comprise generating the second baseband signal independently (e.g., corresponding to a communication independent of a communication associated with the first baseband signal). Step 830 may alternatively, for example, comprise generating the second baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the second baseband signal and the first baseband signal for a single communication).</p> <p><i>See, e.g.</i>, Rofougaran at 11:53-13:4.</p> <p>Furthermore, this claim element is obvious in light of Rofougaran itself, when combined with any of the other references as charted for this claim element in Exs. A-1–A-31, First Supplemental Ex. A-Obviousness Chart, and/or when combined with the knowledge of one of ordinary skill in the art. Motivations to combine may come from the knowledge of the person of ordinary skill themselves, or from the known problems and predictable solutions as embodied in these references. Further motivations to combine references and additional details may be found in the Cover Pleading and First Supplemental Ex. A-Obviousness Chart.</p>
[10.3] receiving a second digital signal comprising second data to be transmitted;	Rofougaran discloses “receiving a second digital signal comprising second data to be transmitted.” See, e.g.:

Claim 10 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>The diagram illustrates a signal processing system for spectral placement. It starts with two baseband signals: 'First Baseband Signal' (201) and 'Second Baseband Signal' (202), which are fed into a 'Spectral Placement Module' (210). This module outputs signals 211 and 212, which are positioned at frequencies $-f_s$ and f_s relative to a sampling frequency f_s. These signals are then combined by a 'Signal Combiner' (230). The combined signal 247 is fed into a local oscillator (LO) 246, which also receives a reference signal 245 from a reference source 244. The LO 246 generates a local oscillator signal 248. This signal is then processed by a power amplifier (PA) 250, which also receives a signal 252. The PA 250 outputs the final RF signal 250.</p>

Figure 2

See, e.g., Rofougaran at Figure 2.

Claim 10 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>The diagram illustrates a signal processing system for two baseband signals. On the left, two baseband signals enter the system: the ^{1st} Baseband Signal enters a DAC labeled 592, and the ^{2nd} Baseband Signal enters a DAC labeled 594. The outputs of these DACs feed into a Spectral Placement Module labeled 510. The output of the Spectral Placement Module 510 then enters a Signal Combiner labeled 530. The Signal Combiner 530 also receives input from an optional module, the Optional Second Spectral Placement Module labeled 520. The output of the Signal Combiner 530 is fed into an Upconverter labeled 540, which then connects to an RF Xmit Stage labeled 550. An arrow labeled 500 points to the top of the first DAC 592.</p>

Figure 5

See, e.g., Rofougaran at Figure 5.

Claim 10 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>The diagram illustrates a communication system architecture. A 'First Baseband Signal' enters a 'Spectral Placement Module' (710). A 'Second Baseband Signal' enters an 'Optional Second Spectral Placement Module' (720). Both modules output signals to mixers. The mixer for the first module receives a local oscillator signal from 'LO1' (e.g., 2.446 GHz) labeled 742. The mixer for the second module receives a local oscillator signal from 'LO2' (e.g., 2.486 GHz) labeled 746. The outputs of the mixers feed into an 'RF Signal Combiner' (730), which then connects to an 'RF Xmit Stage' (750) for transmission.</p>

Figure 7

See, e.g., Rofougaran at Figure 7.

FIG. 1 is a diagram showing a portion of a first non-limiting exemplary communication system 100, in accordance with various aspects of the present invention. The communication system (or device) may comprise characteristics of any of a variety of communication systems/devices (e.g., multimode wireless communication devices). For example and without limitation, the communication system may comprise characteristics of any of a variety of mobile wireless communication devices (e.g.,

Claim 10 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>cellular phones, paging devices, portable email devices, etc.). Also for example, the communication system may comprise characteristics of fixed communication systems or devices (e.g., network access points, base stations, satellites, wireless routers, set top boxes, etc.). Further for example, the communication system may comprise characteristics of a variety of electronic devices with wireless communication capability (e.g., televisions, music players, cameras, remote controls, personal digital assistants, handheld computers, gaming devices, etc.). Accordingly, the scope of various aspects of the present invention should not be limited by characteristics of particular communication systems or devices.</p> <p>The following discussion will, at times, refer to various communication modes. A multimode communication device may, for example, be adapted to communicate in a plurality of such communication modes. For the following discussion, a communication mode may generally be considered to coincide with communication utilizing a particular communication protocol or standard. A non-limiting list of exemplary communication protocols includes various cellular communication protocols (e.g., GSM, GPRS, EDGE, CDMA, WCDMA, TDMA, PDC, etc.), various wireless networking protocols or standards, including WLAN, WMAN, WPAN and WWAN (e.g., IEEE 802.11, Bluetooth, IEEE 802.15, UWB, IEEE 802.16, IEEE 802.20, Zigbee, any WiFi protocol, etc.), various television communication standards, etc. The scope of various aspects of the present invention should not be limited by characteristics of particular communication modes or protocols, whether standard or proprietary.</p> <p>The exemplary communication system 100 may comprise at least a first input 101 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to any of the previously mentioned communication protocols.</p> <p>The exemplary communication system 100 may also comprise at least a second input 102 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first</p>

Claim 10 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>communication protocol discussed above). For example and without limitation, the second baseband signal may correspond to any of the previously mentioned communication protocols. The first baseband signal and the second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of the communication system 100. For example, such modules may generate the first and second baseband signals independently (e.g., corresponding to independent respective communications). Alternatively, for example, such modules may generate the first and second baseband signals in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first and second baseband signals for a single communication).</p> <p>The exemplary communication system 100 may additionally comprise a spectral placement module 110 that is adapted to spectrally shift the first baseband signal (i.e., shift the frequency spectrum of the first baseband signal). In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to spectrally shift the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with the second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to implement a frequency-hopping scheme with the first baseband signal. For example, in a scenario, where there are one or more frequency bands (e.g., a second frequency space) associated with the second baseband signal, the spectral placement module 110 may be adapted to shift the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p><i>See, e.g., Rofougaran at 2:38-3:58.</i></p> <p>The exemplary communication system 100 may also comprise a second spectral placement module 120. Such a second spectral placement module 120 may, for example, share any or all characteristics</p>

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	<p>with the spectral placement module 110 discussed previously. The incorporation of such a second spectral placement module 120 may, for example, provide spectral shifting flexibility. For example, in such an exemplary configuration, either or both of the first and second baseband signals may be spectrally shifted to substantially distinct frequency spaces. Also for example, in such an exemplary configuration, either or both of the first and second baseband signals may be frequency hopped. Note that though the second spectral placement module 120 is illustrated separate from the first spectral placement module 110, the second spectral placement module 120 may share any or all hardware and/or software components with the spectral placement module 110.</p> <p>The exemplary communication system 100 may further comprise a signal combiner 130 that is adapted to generate a composite signal comprising various input signals to the signal combiner 130. For example, the composite signal may simultaneously (i.e., at an instant in time) comprise components associated with various input signals. Note that such simultaneity need not always be present. For example, at a first instant in time, the signal output from the signal combiner 130 might comprise a plurality of components associated with a plurality of respective input signals, at a second instant in time, the signal output from the signal combiner 130 might comprise a single component associated with a single respective input signal, and at a third instant in time, the signal output from the signal combiner 130 might comprise no components.</p> <p>In a first non-limiting exemplary scenario, the signal combiner 130 may receive a first signal that is based on the first baseband signal (e.g., associated with a first communication protocol). Also, the signal combiner 130 may receive a second signal that is based on the second baseband signal (e.g., associated with a second communication protocol). In such a scenario, the signal combiner 130 may combine the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the first baseband signal and a second signal component based on the second baseband signal. In such a scenario, for example where the frequency spectra of the first and second baseband signals do not overlap, the first and second baseband signals might not be spectrally shifted prior to combining by the signal combiner 130. In such a scenario, the spectral placement module 110 (and optionally, the second spectral placement module 120) may receive a control signal indicating whether or not to perform spectral shifting and/or to what degree spectral shifting should be implemented.</p>

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	<p><i>See, e.g.</i>, Rofougaran at 4:16-67.</p> <p>Various components of the exemplary communication system 100 (and other communication systems illustrated and discussed herein) may be implemented in analog and/or digital circuitry. To illustrate this, the exemplary communication system 100 is not shown with analog-to-digital converters (ADCs) or digital-to-analog converters (DACs). FIGS. 4-6, to be discussed later, show various non-limiting exemplary configurations including such converters.</p> <p>FIG. 2 is a diagram showing a portion of a second non-limiting exemplary communication system 200, in accordance with various aspects of the present invention. The communication system 200 may, for example and without limitation, share any or all characteristics with the communication system 100 illustrated in FIG. 1 and discussed previously.</p> <p>The exemplary communication system 200 may comprise at least a first input 201 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to the Bluetooth communication protocol. FIG. 2 shows an exemplary frequency spectrum 203 associated with the first baseband signal.</p> <p>The exemplary communication system 200 may also comprise at least a second input 202 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first communication protocol discussed above). For example and without limitation, the first baseband signal may correspond to an IEEE 802.11 communication protocol (e.g., IEEE 802.11(b) or IEEE 802.11(g)). FIG. 2 shows an exemplary frequency spectrum 204 associated with the second baseband signal.</p> <p><i>See, e.g.</i>, Rofougaran at 5:64-6:31.</p>

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	<p>In a non-limiting exemplary configuration illustrated in FIG. 2, the signal combiner 230 receives a first signal from the spectral placement module 210 that is based on the spectrally shifted first baseband signal. Also, the signal combiner 230 receives a second signal that is based on the second baseband signal. In such a configuration, the signal combiner 230 combines the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the spectrally shifted first baseband signal and a second signal component based on the second baseband signal (e.g., not spectrally shifted).</p> <p>FIG. 2 shows an exemplary frequency spectrum 231 associated with the composite signal formed by the signal combiner 230. The spectrum 231 comprises a first portion 233 corresponding to the first signal component, and a second portion 232 corresponding to the second signal component. Note that the first portion 233 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 232.</p> <p>The exemplary communication system 200 may also comprise an upconverter 240 adapted to upconvert a signal (e.g., the composite signal from the signal combiner 230) for transmission. The upconverter 240 may, for example and without limitation, share any or all characteristics with the upconverter 140 discussed previously.</p> <p>The upconverter 240 may, for example, comprise a mixer 247, a local oscillator 246 and one or more filters 248. The mixer 247 may, for example, receive the composite signal from the signal combiner 230 and an RF mixing signal at frequency fRF from a local oscillator 246. The upconverter 240 may, for example, filter the upconverted signal from the mixer 247 with one or more filters 248. The output of the upconverter 240 may, for example, comprise a signal indicative of the composite signal spectrally shifted to an RF frequency.</p> <p>FIG. 2 shows an exemplary frequency spectrum 241 associated with the RF signal formed by the upconverter 240. The frequency spectrum 241 comprises a first portion 243 corresponding to the first signal component and a second portion 242 corresponding to the second signal component. Note that the first portion 243 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 242. Also note that the first portion 243 and</p>

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	<p>second portion 242 might be formed with a first mirror portion 244 and second mirror portion 245, respectively. Note that a mirror portion may either be removed or may be kept for later processing. The exemplary communication system 200 may further comprise a RF transmission stage 250 adapted to transmit an RF signal. The RF transmission stage 250 may, for example and without limitation, share any or all characteristics with the RF transmission stage 150 discussed previously. Such an RF signal may, for example, be associated with the composite signal output from the signal combiner 230 and upconverted by the upconverter 240. The RF transmission stage 250 may, for example and without limitation, comprise a power amplifier 252, antenna 254 and other components generally associated with RF signal transmission.</p> <p><i>See, e.g., Rofougaran at 6:66-7:57.</i></p> <p>For example, the spectral placement module 510, optional second spectral placement module 520 and signal combiner 530 may operate in the analog domain. The first digital-to-analog converter 592 may convert the first baseband signal to the analog domain for processing by the spectral placement module 510. The second digital-to-analog converter 594 may convert the second baseband signal to the analog domain for processing by the second spectral placement module 520 or signal combiner 530. The signal combiner 530 then combines signals in the analog domain to generate an analog composite signal, which is then upconverted and transmitted by the upconverter 540 and RF transmission stage 550, respectively.</p> <p><i>See, e.g., Rofougaran at 9:30-41.</i></p> <p>FIG. 7 is a diagram showing a portion of a seventh non-limiting exemplary communication system 700, in accordance with various aspects of the present invention. The exemplary communication system 700 may, for example and without limitation, share any or all characteristics with the exemplary systems 100-600 illustrated in FIGS. 1-6 and discussed previously.</p> <p>The exemplary communication system 700 may comprise a first mixer 744 that receives a spectrally shifted first baseband signal from the spectral placement module 710 and a first RF mixing signal (e.g., a 2.446 GHz signal generally associated with the Bluetooth communication protocol) from a</p>

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	<p>first local oscillator 742. The exemplary communication system 700 may also comprise a second mixer 748 that receives a second baseband signal (or a spectrally shifted second baseband signal) and a second RF mixing signal (e.g., a 2.486 GHz signal generally associated with the IEEE 802.11(g) communication protocol) from a second local oscillator 746.</p> <p>The exemplary communication system 700 may comprise an RF signal combiner 730 that is adapted to combine input RF signals. The RF signal combiner 730 may, for example, receive and combine the output signals from the first mixer 744 and second mixer 748 to generate an RF composite signal. The exemplary communication system 700 may also comprise a RF transmission stage 750 that receives the RF composite signal from the RF signal combiner 730 and transmit the signal.</p> <p><i>See, e.g.</i>, Rofougaran at 10:18-43.</p> <p>The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 810 comprises receiving the first baseband signal, step 810 may comprise receiving the first baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The first baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 810 may, for example, comprise generating the first baseband signal independently (e.g., corresponding to an independent communication). Step 810 may alternatively, for example, comprise generating the first baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first baseband signal and other baseband signals for a single communication).</p> <p>The exemplary method 800 may, at step 820, comprise spectrally placing (or shifting) the first baseband signal (e.g., received at step 810). Step 820 may, for example and without limitation, share any or all functional characteristics with the spectral placement modules 110-710 of the exemplary systems 100-700 illustrated in FIGS. 1-7 and discussed previously.</p>

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	<p>Step 820 may, for example, comprise spectrally shifting the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with a second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, step 820 may comprise implementing a frequency-hopping scheme with the first baseband signal. For example, in a scenario where there are one or more frequency bands (e.g., a second frequency space) associated with a second baseband signal, step 820 may comprise spectrally shifting the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p>In another non-limiting exemplary scenario, spectrally shifting the first baseband signal may result in the production of a spectral image (e.g., frequency content mirrored about a mixing frequency utilized to spectrally shift the first baseband signal). In such a scenario, step 820 may comprise accepting or rejecting the image.</p> <p>In a scenario where an image is rejected, step 820 may comprise rejecting the image in any of a variety of manners. For example and without limitation, step 820 may comprise performing image reject mixing to spectrally shift the first baseband signal. Such image reject mixing generally comprises spectrally shifting a signal and rejecting an image associated with the spectrally shifted signal. Also for example, step 820 may comprise filtering out an unwanted image. The scope of various aspects of the present invention should not be limited by the utilization of image rejection or by any particular manner of performing such image rejection.</p> <p>The exemplary method 800 may, at step 830, comprise generating and/or receiving a second baseband signal corresponding to a second communication protocol (e.g., different from the first communication protocol). Step 830 may, for example and without limitation, share any or all functional characteristics with the second input 102 of the exemplary system 100 illustrated in FIG. 1 and discussed previously.</p>

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	<p>The second baseband signal may, for example, correspond to a second communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 830 comprises receiving the second baseband signal, step 830 may comprise receiving the second baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 830 may, for example, comprise generating the second baseband signal independently (e.g., corresponding to a communication independent of a communication associated with the first baseband signal). Step 830 may alternatively, for example, comprise generating the second baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the second baseband signal and the first baseband signal for a single communication).</p> <p><i>See, e.g., Rofougaran at 11:53-13:4.</i></p> <p>Furthermore, this claim element is obvious in light of Rofougaran itself, when combined with any of the other references as charted for this claim element in Exs. A-1–A-31, First Supplemental Ex. A-Obviousness Chart, and/or when combined with the knowledge of one of ordinary skill in the art. Motivations to combine may come from the knowledge of the person of ordinary skill themselves, or from the known problems and predictable solutions as embodied in these references. Further motivations to combine references and additional details may be found in the Cover Pleading and First Supplemental Ex. A-Obviousness Chart.</p>
[10.4] converting the first digital signal into a first analog signal using a first digital-to-analog converter, the first analog signal carrying the first data across a first frequency range;;	Rofougaran discloses “converting the first digital signal into a first analog signal using a first digital-to-analog converter, the first analog signal carrying the first data across a first frequency range.” See, e.g.:

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	<p>The diagram illustrates a signal processing system for spectral placement. It starts with two baseband signals: 'First Baseband Signal' (201) and 'Second Baseband Signal' (202), which are fed into a 'Spectral Placement Module' (210). This module outputs signals 211 and 212, which are positioned at frequencies $-f_s$ and f_s relative to a sampling frequency f_s. These signals are then combined by a 'Signal Combiner' (230). The combined signal 247 is fed into a mixer (246) along with a 'Local Oscillator' (LO) signal 240. The mixer also includes a low-pass filter (248). The output of the mixer 247 is then processed by a power amplifier (PA) (250) and transmitted via an antenna (252). The system also includes a feedback path from the antenna 252 through a low-pass filter (241) back to the mixer 246. Frequency markers f_{RF} and $-f_{RF}$ are indicated on the final frequency axis.</p>

Figure 2

See, e.g., Rofougaran at Figure 2.

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	<p>The diagram illustrates a signal processing chain for RF transmission. It begins with two baseband signals: the 1st Baseband Signal and the 2nd Baseband Signal. These signals are processed by two DACs (Digital-to-Analog Converters), labeled 592 and 594. The outputs of the DACs are fed into a Spectral Placement Module (510) and an optional second spectral placement module (520). The outputs from the modules are combined at a Signal Combiner (530). The combined signal then passes through an Upconverter (540) and an RF Xmit Stage (550) before being transmitted.</p>

Figure 5

See, e.g., Rofougaran at Figure 5.

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	<p>The diagram illustrates a communication system architecture. A 'First Baseband Signal' (700) enters a 'Spectral Placement Module' (710). A 'Second Baseband Signal' (720) enters an 'Optional Second Spectral Placement Module' (720), which is shown within a dashed box. Both modules output signals to mixers. The mixer for the first module receives a local oscillator signal from 'LO1' (742, e.g., 2.446 GHz) and outputs to a 'RF Signal Combiner' (730). The mixer for the second module receives a local oscillator signal from 'LO2' (746, e.g., 2.486 GHz) and also outputs to the 'RF Signal Combiner'. The 'RF Signal Combiner' (730) then feeds into an 'RF Xmit Stage' (750), which transmits the final signal.</p>

Figure 7

See, e.g., Rofougaran at Figure 7.

FIG. 1 is a diagram showing a portion of a first non-limiting exemplary communication system 100, in accordance with various aspects of the present invention. The communication system (or device) may comprise characteristics of any of a variety of communication systems/devices (e.g., multimode wireless communication devices). For example and without limitation, the communication system may comprise characteristics of any of a variety of mobile wireless communication devices (e.g.,

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	<p>cellular phones, paging devices, portable email devices, etc.). Also for example, the communication system may comprise characteristics of fixed communication systems or devices (e.g., network access points, base stations, satellites, wireless routers, set top boxes, etc.). Further for example, the communication system may comprise characteristics of a variety of electronic devices with wireless communication capability (e.g., televisions, music players, cameras, remote controls, personal digital assistants, handheld computers, gaming devices, etc.). Accordingly, the scope of various aspects of the present invention should not be limited by characteristics of particular communication systems or devices.</p> <p>The following discussion will, at times, refer to various communication modes. A multimode communication device may, for example, be adapted to communicate in a plurality of such communication modes. For the following discussion, a communication mode may generally be considered to coincide with communication utilizing a particular communication protocol or standard. A non-limiting list of exemplary communication protocols includes various cellular communication protocols (e.g., GSM, GPRS, EDGE, CDMA, WCDMA, TDMA, PDC, etc.), various wireless networking protocols or standards, including WLAN, WMAN, WPAN and WWAN (e.g., IEEE 802.11, Bluetooth, IEEE 802.15, UWB, IEEE 802.16, IEEE 802.20, Zigbee, any WiFi protocol, etc.), various television communication standards, etc. The scope of various aspects of the present invention should not be limited by characteristics of particular communication modes or protocols, whether standard or proprietary.</p> <p>The exemplary communication system 100 may comprise at least a first input 101 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to any of the previously mentioned communication protocols.</p> <p>The exemplary communication system 100 may also comprise at least a second input 102 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first</p>

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	<p>communication protocol discussed above). For example and without limitation, the second baseband signal may correspond to any of the previously mentioned communication protocols. The first baseband signal and the second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of the communication system 100. For example, such modules may generate the first and second baseband signals independently (e.g., corresponding to independent respective communications). Alternatively, for example, such modules may generate the first and second baseband signals in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first and second baseband signals for a single communication).</p> <p>The exemplary communication system 100 may additionally comprise a spectral placement module 110 that is adapted to spectrally shift the first baseband signal (i.e., shift the frequency spectrum of the first baseband signal). In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to spectrally shift the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with the second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to implement a frequency-hopping scheme with the first baseband signal. For example, in a scenario, where there are one or more frequency bands (e.g., a second frequency space) associated with the second baseband signal, the spectral placement module 110 may be adapted to shift the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p><i>See, e.g., Rofougaran at 2:38-3:58.</i></p> <p>The exemplary communication system 100 may also comprise a second spectral placement module 120. Such a second spectral placement module 120 may, for example, share any or all characteristics</p>

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	<p>with the spectral placement module 110 discussed previously. The incorporation of such a second spectral placement module 120 may, for example, provide spectral shifting flexibility. For example, in such an exemplary configuration, either or both of the first and second baseband signals may be spectrally shifted to substantially distinct frequency spaces. Also for example, in such an exemplary configuration, either or both of the first and second baseband signals may be frequency hopped. Note that though the second spectral placement module 120 is illustrated separate from the first spectral placement module 110, the second spectral placement module 120 may share any or all hardware and/or software components with the spectral placement module 110.</p> <p>The exemplary communication system 100 may further comprise a signal combiner 130 that is adapted to generate a composite signal comprising various input signals to the signal combiner 130. For example, the composite signal may simultaneously (i.e., at an instant in time) comprise components associated with various input signals. Note that such simultaneity need not always be present. For example, at a first instant in time, the signal output from the signal combiner 130 might comprise a plurality of components associated with a plurality of respective input signals, at a second instant in time, the signal output from the signal combiner 130 might comprise a single component associated with a single respective input signal, and at a third instant in time, the signal output from the signal combiner 130 might comprise no components.</p> <p>In a first non-limiting exemplary scenario, the signal combiner 130 may receive a first signal that is based on the first baseband signal (e.g., associated with a first communication protocol). Also, the signal combiner 130 may receive a second signal that is based on the second baseband signal (e.g., associated with a second communication protocol). In such a scenario, the signal combiner 130 may combine the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the first baseband signal and a second signal component based on the second baseband signal. In such a scenario, for example where the frequency spectra of the first and second baseband signals do not overlap, the first and second baseband signals might not be spectrally shifted prior to combining by the signal combiner 130. In such a scenario, the spectral placement module 110 (and optionally, the second spectral placement module 120) may receive a control signal indicating whether or not to perform spectral shifting and/or to what degree spectral shifting should be implemented.</p>

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	<p><i>See, e.g.</i>, Rofougaran at 4:16-67.</p> <p>Various components of the exemplary communication system 100 (and other communication systems illustrated and discussed herein) may be implemented in analog and/or digital circuitry. To illustrate this, the exemplary communication system 100 is not shown with analog-to-digital converters (ADCs) or digital-to-analog converters (DACs). FIGS. 4-6, to be discussed later, show various non-limiting exemplary configurations including such converters.</p> <p>FIG. 2 is a diagram showing a portion of a second non-limiting exemplary communication system 200, in accordance with various aspects of the present invention. The communication system 200 may, for example and without limitation, share any or all characteristics with the communication system 100 illustrated in FIG. 1 and discussed previously.</p> <p>The exemplary communication system 200 may comprise at least a first input 201 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to the Bluetooth communication protocol. FIG. 2 shows an exemplary frequency spectrum 203 associated with the first baseband signal.</p> <p>The exemplary communication system 200 may also comprise at least a second input 202 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first communication protocol discussed above). For example and without limitation, the first baseband signal may correspond to an IEEE 802.11 communication protocol (e.g., IEEE 802.11(b) or IEEE 802.11(g)). FIG. 2 shows an exemplary frequency spectrum 204 associated with the second baseband signal.</p> <p><i>See, e.g.</i>, Rofougaran at 5:64-6:31.</p>

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	<p>In a non-limiting exemplary configuration illustrated in FIG. 2, the signal combiner 230 receives a first signal from the spectral placement module 210 that is based on the spectrally shifted first baseband signal. Also, the signal combiner 230 receives a second signal that is based on the second baseband signal. In such a configuration, the signal combiner 230 combines the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the spectrally shifted first baseband signal and a second signal component based on the second baseband signal (e.g., not spectrally shifted).</p> <p>FIG. 2 shows an exemplary frequency spectrum 231 associated with the composite signal formed by the signal combiner 230. The spectrum 231 comprises a first portion 233 corresponding to the first signal component, and a second portion 232 corresponding to the second signal component. Note that the first portion 233 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 232.</p> <p>The exemplary communication system 200 may also comprise an upconverter 240 adapted to upconvert a signal (e.g., the composite signal from the signal combiner 230) for transmission. The upconverter 240 may, for example and without limitation, share any or all characteristics with the upconverter 140 discussed previously.</p> <p>The upconverter 240 may, for example, comprise a mixer 247, a local oscillator 246 and one or more filters 248. The mixer 247 may, for example, receive the composite signal from the signal combiner 230 and an RF mixing signal at frequency fRF from a local oscillator 246. The upconverter 240 may, for example, filter the upconverted signal from the mixer 247 with one or more filters 248. The output of the upconverter 240 may, for example, comprise a signal indicative of the composite signal spectrally shifted to an RF frequency.</p> <p>FIG. 2 shows an exemplary frequency spectrum 241 associated with the RF signal formed by the upconverter 240. The frequency spectrum 241 comprises a first portion 243 corresponding to the first signal component and a second portion 242 corresponding to the second signal component. Note that the first portion 243 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 242. Also note that the first portion 243 and</p>

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	<p>second portion 242 might be formed with a first mirror portion 244 and second mirror portion 245, respectively. Note that a mirror portion may either be removed or may be kept for later processing. The exemplary communication system 200 may further comprise a RF transmission stage 250 adapted to transmit an RF signal. The RF transmission stage 250 may, for example and without limitation, share any or all characteristics with the RF transmission stage 150 discussed previously. Such an RF signal may, for example, be associated with the composite signal output from the signal combiner 230 and upconverted by the upconverter 240. The RF transmission stage 250 may, for example and without limitation, comprise a power amplifier 252, antenna 254 and other components generally associated with RF signal transmission.</p> <p><i>See, e.g., Rofougaran at 6:66-7:57.</i></p> <p>For example, the spectral placement module 510, optional second spectral placement module 520 and signal combiner 530 may operate in the analog domain. The first digital-to-analog converter 592 may convert the first baseband signal to the analog domain for processing by the spectral placement module 510. The second digital-to-analog converter 594 may convert the second baseband signal to the analog domain for processing by the second spectral placement module 520 or signal combiner 530. The signal combiner 530 then combines signals in the analog domain to generate an analog composite signal, which is then upconverted and transmitted by the upconverter 540 and RF transmission stage 550, respectively.</p> <p><i>See, e.g., Rofougaran at 9:30-41.</i></p> <p>FIG. 7 is a diagram showing a portion of a seventh non-limiting exemplary communication system 700, in accordance with various aspects of the present invention. The exemplary communication system 700 may, for example and without limitation, share any or all characteristics with the exemplary systems 100-600 illustrated in FIGS. 1-6 and discussed previously.</p> <p>The exemplary communication system 700 may comprise a first mixer 744 that receives a spectrally shifted first baseband signal from the spectral placement module 710 and a first RF mixing signal (e.g., a 2.446 GHz signal generally associated with the Bluetooth communication protocol) from a</p>

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	<p>first local oscillator 742. The exemplary communication system 700 may also comprise a second mixer 748 that receives a second baseband signal (or a spectrally shifted second baseband signal) and a second RF mixing signal (e.g., a 2.486 GHz signal generally associated with the IEEE 802.11(g) communication protocol) from a second local oscillator 746.</p> <p>The exemplary communication system 700 may comprise an RF signal combiner 730 that is adapted to combine input RF signals. The RF signal combiner 730 may, for example, receive and combine the output signals from the first mixer 744 and second mixer 748 to generate an RF composite signal. The exemplary communication system 700 may also comprise a RF transmission stage 750 that receives the RF composite signal from the RF signal combiner 730 and transmit the signal.</p> <p><i>See, e.g., Rofougaran at 10:18-43.</i></p> <p>The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 810 comprises receiving the first baseband signal, step 810 may comprise receiving the first baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The first baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 810 may, for example, comprise generating the first baseband signal independently (e.g., corresponding to an independent communication). Step 810 may alternatively, for example, comprise generating the first baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first baseband signal and other baseband signals for a single communication).</p> <p>The exemplary method 800 may, at step 820, comprise spectrally placing (or shifting) the first baseband signal (e.g., received at step 810). Step 820 may, for example and without limitation, share any or all functional characteristics with the spectral placement modules 110-710 of the exemplary systems 100-700 illustrated in FIGS. 1-7 and discussed previously.</p>

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	<p>Step 820 may, for example, comprise spectrally shifting the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with a second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, step 820 may comprise implementing a frequency-hopping scheme with the first baseband signal. For example, in a scenario where there are one or more frequency bands (e.g., a second frequency space) associated with a second baseband signal, step 820 may comprise spectrally shifting the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p>In another non-limiting exemplary scenario, spectrally shifting the first baseband signal may result in the production of a spectral image (e.g., frequency content mirrored about a mixing frequency utilized to spectrally shift the first baseband signal). In such a scenario, step 820 may comprise accepting or rejecting the image.</p> <p>In a scenario where an image is rejected, step 820 may comprise rejecting the image in any of a variety of manners. For example and without limitation, step 820 may comprise performing image reject mixing to spectrally shift the first baseband signal. Such image reject mixing generally comprises spectrally shifting a signal and rejecting an image associated with the spectrally shifted signal. Also for example, step 820 may comprise filtering out an unwanted image. The scope of various aspects of the present invention should not be limited by the utilization of image rejection or by any particular manner of performing such image rejection.</p> <p>The exemplary method 800 may, at step 830, comprise generating and/or receiving a second baseband signal corresponding to a second communication protocol (e.g., different from the first communication protocol). Step 830 may, for example and without limitation, share any or all functional characteristics with the second input 102 of the exemplary system 100 illustrated in FIG. 1 and discussed previously.</p>

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	<p>The second baseband signal may, for example, correspond to a second communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 830 comprises receiving the second baseband signal, step 830 may comprise receiving the second baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 830 may, for example, comprise generating the second baseband signal independently (e.g., corresponding to a communication independent of a communication associated with the first baseband signal). Step 830 may alternatively, for example, comprise generating the second baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the second baseband signal and the first baseband signal for a single communication).</p> <p><i>See, e.g., Rofougaran at 11:53-13:4.</i></p> <p>Furthermore, this claim element is obvious in light of Rofougaran itself, when combined with any of the other references as charted for this claim element in Exs. A-1–A-31, First Supplemental Ex. A-Obviousness Chart, and/or when combined with the knowledge of one of ordinary skill in the art. Motivations to combine may come from the knowledge of the person of ordinary skill themselves, or from the known problems and predictable solutions as embodied in these references. Further motivations to combine references and additional details may be found in the Cover Pleading and First Supplemental Ex. A-Obviousness Chart.</p>
[10.5] converting the second digital signal into a second analog signal using a second digital-to-analog converter, the second analog signal carrying the second data across a second frequency range;	Rofougaran discloses “converting the second digital signal into a second analog signal using a second digital-to-analog converter, the second analog signal carrying the second data across a second frequency range.” See, e.g.:

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	<p>The diagram illustrates a signal processing system for spectral placement. It starts with two baseband signals: 'First Baseband Signal' (201) and 'Second Baseband Signal' (202), which are fed into a 'Spectral Placement Module' (210). This module outputs signals 211 and 212, which are positioned at frequencies $-f_s$ and f_s relative to a sampling frequency f_s. These signals are then combined by a 'Signal Combiner' (230). The combined signal 247 is fed into a local oscillator (LO) 246, which also receives a reference signal 245 from a reference source 244. The LO 246 generates a local oscillator signal 248. This signal is then processed by a power amplifier (PA) 250, which also receives a signal 252. The PA 250 outputs the final RF signal 250.</p>

Figure 2

See, e.g., Rofougaran at Figure 2.

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	<p>The diagram illustrates a signal processing chain for RF transmission. It begins with two baseband signals: the 1st Baseband Signal and the 2nd Baseband Signal. These signals are processed by two DACs (Digital-to-Analog Converters), labeled 592 and 594. The outputs of the DACs are fed into a Spectral Placement Module (510) and an optional second spectral placement module (520). The outputs from the modules are combined at a Signal Combiner (530). The combined signal then passes through an Upconverter (540) and an RF Xmit Stage (550) before being transmitted.</p>

Figure 5

See, e.g., Rofougaran at Figure 5.

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Figure 7

See, e.g., Rofougaran at Figure 7.

FIG. 1 is a diagram showing a portion of a first non-limiting exemplary communication system 100, in accordance with various aspects of the present invention. The communication system (or device) may comprise characteristics of any of a variety of communication systems/devices (e.g., multimode wireless communication devices). For example and without limitation, the communication system may comprise characteristics of any of a variety of mobile wireless communication devices (e.g.,

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	<p>cellular phones, paging devices, portable email devices, etc.). Also for example, the communication system may comprise characteristics of fixed communication systems or devices (e.g., network access points, base stations, satellites, wireless routers, set top boxes, etc.). Further for example, the communication system may comprise characteristics of a variety of electronic devices with wireless communication capability (e.g., televisions, music players, cameras, remote controls, personal digital assistants, handheld computers, gaming devices, etc.). Accordingly, the scope of various aspects of the present invention should not be limited by characteristics of particular communication systems or devices.</p> <p>The following discussion will, at times, refer to various communication modes. A multimode communication device may, for example, be adapted to communicate in a plurality of such communication modes. For the following discussion, a communication mode may generally be considered to coincide with communication utilizing a particular communication protocol or standard. A non-limiting list of exemplary communication protocols includes various cellular communication protocols (e.g., GSM, GPRS, EDGE, CDMA, WCDMA, TDMA, PDC, etc.), various wireless networking protocols or standards, including WLAN, WMAN, WPAN and WWAN (e.g., IEEE 802.11, Bluetooth, IEEE 802.15, UWB, IEEE 802.16, IEEE 802.20, Zigbee, any WiFi protocol, etc.), various television communication standards, etc. The scope of various aspects of the present invention should not be limited by characteristics of particular communication modes or protocols, whether standard or proprietary.</p> <p>The exemplary communication system 100 may comprise at least a first input 101 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to any of the previously mentioned communication protocols.</p> <p>The exemplary communication system 100 may also comprise at least a second input 102 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first</p>

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	<p>communication protocol discussed above). For example and without limitation, the second baseband signal may correspond to any of the previously mentioned communication protocols. The first baseband signal and the second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of the communication system 100. For example, such modules may generate the first and second baseband signals independently (e.g., corresponding to independent respective communications). Alternatively, for example, such modules may generate the first and second baseband signals in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first and second baseband signals for a single communication).</p> <p>The exemplary communication system 100 may additionally comprise a spectral placement module 110 that is adapted to spectrally shift the first baseband signal (i.e., shift the frequency spectrum of the first baseband signal). In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to spectrally shift the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with the second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to implement a frequency-hopping scheme with the first baseband signal. For example, in a scenario, where there are one or more frequency bands (e.g., a second frequency space) associated with the second baseband signal, the spectral placement module 110 may be adapted to shift the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p><i>See, e.g., Rofougaran at 2:38-3:58.</i></p> <p>The exemplary communication system 100 may also comprise a second spectral placement module 120. Such a second spectral placement module 120 may, for example, share any or all characteristics</p>

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	<p>with the spectral placement module 110 discussed previously. The incorporation of such a second spectral placement module 120 may, for example, provide spectral shifting flexibility. For example, in such an exemplary configuration, either or both of the first and second baseband signals may be spectrally shifted to substantially distinct frequency spaces. Also for example, in such an exemplary configuration, either or both of the first and second baseband signals may be frequency hopped. Note that though the second spectral placement module 120 is illustrated separate from the first spectral placement module 110, the second spectral placement module 120 may share any or all hardware and/or software components with the spectral placement module 110.</p> <p>The exemplary communication system 100 may further comprise a signal combiner 130 that is adapted to generate a composite signal comprising various input signals to the signal combiner 130. For example, the composite signal may simultaneously (i.e., at an instant in time) comprise components associated with various input signals. Note that such simultaneity need not always be present. For example, at a first instant in time, the signal output from the signal combiner 130 might comprise a plurality of components associated with a plurality of respective input signals, at a second instant in time, the signal output from the signal combiner 130 might comprise a single component associated with a single respective input signal, and at a third instant in time, the signal output from the signal combiner 130 might comprise no components.</p> <p>In a first non-limiting exemplary scenario, the signal combiner 130 may receive a first signal that is based on the first baseband signal (e.g., associated with a first communication protocol). Also, the signal combiner 130 may receive a second signal that is based on the second baseband signal (e.g., associated with a second communication protocol). In such a scenario, the signal combiner 130 may combine the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the first baseband signal and a second signal component based on the second baseband signal. In such a scenario, for example where the frequency spectra of the first and second baseband signals do not overlap, the first and second baseband signals might not be spectrally shifted prior to combining by the signal combiner 130. In such a scenario, the spectral placement module 110 (and optionally, the second spectral placement module 120) may receive a control signal indicating whether or not to perform spectral shifting and/or to what degree spectral shifting should be implemented.</p>

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	<p><i>See, e.g.</i>, Rofougaran at 4:16-67.</p> <p>Various components of the exemplary communication system 100 (and other communication systems illustrated and discussed herein) may be implemented in analog and/or digital circuitry. To illustrate this, the exemplary communication system 100 is not shown with analog-to-digital converters (ADCs) or digital-to-analog converters (DACs). FIGS. 4-6, to be discussed later, show various non-limiting exemplary configurations including such converters.</p> <p>FIG. 2 is a diagram showing a portion of a second non-limiting exemplary communication system 200, in accordance with various aspects of the present invention. The communication system 200 may, for example and without limitation, share any or all characteristics with the communication system 100 illustrated in FIG. 1 and discussed previously.</p> <p>The exemplary communication system 200 may comprise at least a first input 201 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to the Bluetooth communication protocol. FIG. 2 shows an exemplary frequency spectrum 203 associated with the first baseband signal.</p> <p>The exemplary communication system 200 may also comprise at least a second input 202 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first communication protocol discussed above). For example and without limitation, the first baseband signal may correspond to an IEEE 802.11 communication protocol (e.g., IEEE 802.11(b) or IEEE 802.11(g)). FIG. 2 shows an exemplary frequency spectrum 204 associated with the second baseband signal.</p> <p><i>See, e.g.</i>, Rofougaran at 5:64-6:31.</p>

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	<p>In a non-limiting exemplary configuration illustrated in FIG. 2, the signal combiner 230 receives a first signal from the spectral placement module 210 that is based on the spectrally shifted first baseband signal. Also, the signal combiner 230 receives a second signal that is based on the second baseband signal. In such a configuration, the signal combiner 230 combines the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the spectrally shifted first baseband signal and a second signal component based on the second baseband signal (e.g., not spectrally shifted).</p> <p>FIG. 2 shows an exemplary frequency spectrum 231 associated with the composite signal formed by the signal combiner 230. The spectrum 231 comprises a first portion 233 corresponding to the first signal component, and a second portion 232 corresponding to the second signal component. Note that the first portion 233 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 232.</p> <p>The exemplary communication system 200 may also comprise an upconverter 240 adapted to upconvert a signal (e.g., the composite signal from the signal combiner 230) for transmission. The upconverter 240 may, for example and without limitation, share any or all characteristics with the upconverter 140 discussed previously.</p> <p>The upconverter 240 may, for example, comprise a mixer 247, a local oscillator 246 and one or more filters 248. The mixer 247 may, for example, receive the composite signal from the signal combiner 230 and an RF mixing signal at frequency fRF from a local oscillator 246. The upconverter 240 may, for example, filter the upconverted signal from the mixer 247 with one or more filters 248. The output of the upconverter 240 may, for example, comprise a signal indicative of the composite signal spectrally shifted to an RF frequency.</p> <p>FIG. 2 shows an exemplary frequency spectrum 241 associated with the RF signal formed by the upconverter 240. The frequency spectrum 241 comprises a first portion 243 corresponding to the first signal component and a second portion 242 corresponding to the second signal component. Note that the first portion 243 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 242. Also note that the first portion 243 and</p>

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	<p>second portion 242 might be formed with a first mirror portion 244 and second mirror portion 245, respectively. Note that a mirror portion may either be removed or may be kept for later processing. The exemplary communication system 200 may further comprise a RF transmission stage 250 adapted to transmit an RF signal. The RF transmission stage 250 may, for example and without limitation, share any or all characteristics with the RF transmission stage 150 discussed previously. Such an RF signal may, for example, be associated with the composite signal output from the signal combiner 230 and upconverted by the upconverter 240. The RF transmission stage 250 may, for example and without limitation, comprise a power amplifier 252, antenna 254 and other components generally associated with RF signal transmission.</p> <p><i>See, e.g., Rofougaran at 6:66-7:57.</i></p> <p>For example, the spectral placement module 510, optional second spectral placement module 520 and signal combiner 530 may operate in the analog domain. The first digital-to-analog converter 592 may convert the first baseband signal to the analog domain for processing by the spectral placement module 510. The second digital-to-analog converter 594 may convert the second baseband signal to the analog domain for processing by the second spectral placement module 520 or signal combiner 530. The signal combiner 530 then combines signals in the analog domain to generate an analog composite signal, which is then upconverted and transmitted by the upconverter 540 and RF transmission stage 550, respectively.</p> <p><i>See, e.g., Rofougaran at 9:30-41.</i></p> <p>FIG. 7 is a diagram showing a portion of a seventh non-limiting exemplary communication system 700, in accordance with various aspects of the present invention. The exemplary communication system 700 may, for example and without limitation, share any or all characteristics with the exemplary systems 100-600 illustrated in FIGS. 1-6 and discussed previously.</p> <p>The exemplary communication system 700 may comprise a first mixer 744 that receives a spectrally shifted first baseband signal from the spectral placement module 710 and a first RF mixing signal (e.g., a 2.446 GHz signal generally associated with the Bluetooth communication protocol) from a</p>

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	<p>first local oscillator 742. The exemplary communication system 700 may also comprise a second mixer 748 that receives a second baseband signal (or a spectrally shifted second baseband signal) and a second RF mixing signal (e.g., a 2.486 GHz signal generally associated with the IEEE 802.11(g) communication protocol) from a second local oscillator 746.</p> <p>The exemplary communication system 700 may comprise an RF signal combiner 730 that is adapted to combine input RF signals. The RF signal combiner 730 may, for example, receive and combine the output signals from the first mixer 744 and second mixer 748 to generate an RF composite signal. The exemplary communication system 700 may also comprise a RF transmission stage 750 that receives the RF composite signal from the RF signal combiner 730 and transmit the signal.</p> <p><i>See, e.g.</i>, Rofougaran at 10:18-43.</p> <p>The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 810 comprises receiving the first baseband signal, step 810 may comprise receiving the first baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The first baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 810 may, for example, comprise generating the first baseband signal independently (e.g., corresponding to an independent communication). Step 810 may alternatively, for example, comprise generating the first baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first baseband signal and other baseband signals for a single communication).</p> <p>The exemplary method 800 may, at step 820, comprise spectrally placing (or shifting) the first baseband signal (e.g., received at step 810). Step 820 may, for example and without limitation, share any or all functional characteristics with the spectral placement modules 110-710 of the exemplary systems 100-700 illustrated in FIGS. 1-7 and discussed previously.</p>

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	<p>Step 820 may, for example, comprise spectrally shifting the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with a second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, step 820 may comprise implementing a frequency-hopping scheme with the first baseband signal. For example, in a scenario where there are one or more frequency bands (e.g., a second frequency space) associated with a second baseband signal, step 820 may comprise spectrally shifting the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p>In another non-limiting exemplary scenario, spectrally shifting the first baseband signal may result in the production of a spectral image (e.g., frequency content mirrored about a mixing frequency utilized to spectrally shift the first baseband signal). In such a scenario, step 820 may comprise accepting or rejecting the image.</p> <p>In a scenario where an image is rejected, step 820 may comprise rejecting the image in any of a variety of manners. For example and without limitation, step 820 may comprise performing image reject mixing to spectrally shift the first baseband signal. Such image reject mixing generally comprises spectrally shifting a signal and rejecting an image associated with the spectrally shifted signal. Also for example, step 820 may comprise filtering out an unwanted image. The scope of various aspects of the present invention should not be limited by the utilization of image rejection or by any particular manner of performing such image rejection.</p> <p>The exemplary method 800 may, at step 830, comprise generating and/or receiving a second baseband signal corresponding to a second communication protocol (e.g., different from the first communication protocol). Step 830 may, for example and without limitation, share any or all functional characteristics with the second input 102 of the exemplary system 100 illustrated in FIG. 1 and discussed previously.</p>

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	<p>The second baseband signal may, for example, correspond to a second communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 830 comprises receiving the second baseband signal, step 830 may comprise receiving the second baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 830 may, for example, comprise generating the second baseband signal independently (e.g., corresponding to a communication independent of a communication associated with the first baseband signal). Step 830 may alternatively, for example, comprise generating the second baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the second baseband signal and the first baseband signal for a single communication).</p> <p><i>See, e.g.</i>, Rofougaran at 11:53-13:4.</p> <p>Furthermore, this claim element is obvious in light of Rofougaran itself, when combined with any of the other references as charted for this claim element in Exs. A-1–A-31, First Supplemental Ex. A-Obviousness Chart, and/or when combined with the knowledge of one of ordinary skill in the art. Motivations to combine may come from the knowledge of the person of ordinary skill themselves, or from the known problems and predictable solutions as embodied in these references. Further motivations to combine references and additional details may be found in the Cover Pleading and First Supplemental Ex. A-Obviousness Chart.</p>
[10.6] up-converting the first analog signal to a first RF center frequency to produce a first up-converted analog signal, wherein the first up-converted analog signal comprises a first up-converted frequency range from the first	Rofougaran discloses “up-converting the first analog signal to a first RF center frequency to produce a first up-converted analog signal, wherein the first up-converted analog signal comprises a first up-converted frequency range from the first RF center frequency minus one-half the first frequency range to the first RF center frequency plus one-half the first frequency range.” See, e.g.:

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<p>RF center frequency minus one-half the first frequency range to the first RF center frequency plus one-half the first frequency range;</p>	<p>Figure 2</p> <p>See, e.g., Rofougaran at Figure 2.</p>

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	<p>The diagram illustrates a signal processing system for two baseband signals. On the left, two baseband signals enter the system: the 1st Baseband Signal enters a DAC labeled 592, and the 2nd Baseband Signal enters a DAC labeled 594. The outputs of these DACs feed into a Spectral Placement Module labeled 510. The output of the 1st DAC also feeds into an optional second spectral placement module labeled 520. The outputs of the Spectral Placement Module and the optional module are combined at a Signal Combiner labeled 530. The combined signal then passes through an Upconverter labeled 540 and an RF Xmit Stage labeled 550, finally exiting the system.</p>

Figure 5

See, e.g., Rofougaran at Figure 5.

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	<p>The diagram illustrates a communication system architecture. A 'First Baseband Signal' enters a 'Spectral Placement Module' (710). A 'Second Baseband Signal' enters an 'Optional Second Spectral Placement Module' (720). Both modules output signals to mixers. The mixer for the first module receives a local oscillator signal from 'LO1' (e.g., 2.446 GHz) labeled 742. The mixer for the second module receives a local oscillator signal from 'LO2' (e.g., 2.486 GHz) labeled 746. The outputs of the mixers feed into an 'RF Signal Combiner' (730), which then connects to an 'RF Xmit Stage' (750) for transmission.</p>

Figure 7

See, e.g., Rofougaran at Figure 7.

FIG. 1 is a diagram showing a portion of a first non-limiting exemplary communication system 100, in accordance with various aspects of the present invention. The communication system (or device) may comprise characteristics of any of a variety of communication systems/devices (e.g., multimode wireless communication devices). For example and without limitation, the communication system may comprise characteristics of any of a variety of mobile wireless communication devices (e.g.,

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	<p>cellular phones, paging devices, portable email devices, etc.). Also for example, the communication system may comprise characteristics of fixed communication systems or devices (e.g., network access points, base stations, satellites, wireless routers, set top boxes, etc.). Further for example, the communication system may comprise characteristics of a variety of electronic devices with wireless communication capability (e.g., televisions, music players, cameras, remote controls, personal digital assistants, handheld computers, gaming devices, etc.). Accordingly, the scope of various aspects of the present invention should not be limited by characteristics of particular communication systems or devices.</p> <p>The following discussion will, at times, refer to various communication modes. A multimode communication device may, for example, be adapted to communicate in a plurality of such communication modes. For the following discussion, a communication mode may generally be considered to coincide with communication utilizing a particular communication protocol or standard. A non-limiting list of exemplary communication protocols includes various cellular communication protocols (e.g., GSM, GPRS, EDGE, CDMA, WCDMA, TDMA, PDC, etc.), various wireless networking protocols or standards, including WLAN, WMAN, WPAN and WWAN (e.g., IEEE 802.11, Bluetooth, IEEE 802.15, UWB, IEEE 802.16, IEEE 802.20, Zigbee, any WiFi protocol, etc.), various television communication standards, etc. The scope of various aspects of the present invention should not be limited by characteristics of particular communication modes or protocols, whether standard or proprietary.</p> <p>The exemplary communication system 100 may comprise at least a first input 101 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to any of the previously mentioned communication protocols.</p> <p>The exemplary communication system 100 may also comprise at least a second input 102 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first</p>

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	<p>communication protocol discussed above). For example and without limitation, the second baseband signal may correspond to any of the previously mentioned communication protocols. The first baseband signal and the second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of the communication system 100. For example, such modules may generate the first and second baseband signals independently (e.g., corresponding to independent respective communications). Alternatively, for example, such modules may generate the first and second baseband signals in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first and second baseband signals for a single communication).</p> <p>The exemplary communication system 100 may additionally comprise a spectral placement module 110 that is adapted to spectrally shift the first baseband signal (i.e., shift the frequency spectrum of the first baseband signal). In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to spectrally shift the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with the second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to implement a frequency-hopping scheme with the first baseband signal. For example, in a scenario, where there are one or more frequency bands (e.g., a second frequency space) associated with the second baseband signal, the spectral placement module 110 may be adapted to shift the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p><i>See, e.g., Rofougaran at 2:38-3:58.</i></p> <p>The exemplary communication system 100 may also comprise a second spectral placement module 120. Such a second spectral placement module 120 may, for example, share any or all characteristics</p>

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	<p>with the spectral placement module 110 discussed previously. The incorporation of such a second spectral placement module 120 may, for example, provide spectral shifting flexibility. For example, in such an exemplary configuration, either or both of the first and second baseband signals may be spectrally shifted to substantially distinct frequency spaces. Also for example, in such an exemplary configuration, either or both of the first and second baseband signals may be frequency hopped. Note that though the second spectral placement module 120 is illustrated separate from the first spectral placement module 110, the second spectral placement module 120 may share any or all hardware and/or software components with the spectral placement module 110.</p> <p>The exemplary communication system 100 may further comprise a signal combiner 130 that is adapted to generate a composite signal comprising various input signals to the signal combiner 130. For example, the composite signal may simultaneously (i.e., at an instant in time) comprise components associated with various input signals. Note that such simultaneity need not always be present. For example, at a first instant in time, the signal output from the signal combiner 130 might comprise a plurality of components associated with a plurality of respective input signals, at a second instant in time, the signal output from the signal combiner 130 might comprise a single component associated with a single respective input signal, and at a third instant in time, the signal output from the signal combiner 130 might comprise no components.</p> <p>In a first non-limiting exemplary scenario, the signal combiner 130 may receive a first signal that is based on the first baseband signal (e.g., associated with a first communication protocol). Also, the signal combiner 130 may receive a second signal that is based on the second baseband signal (e.g., associated with a second communication protocol). In such a scenario, the signal combiner 130 may combine the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the first baseband signal and a second signal component based on the second baseband signal. In such a scenario, for example where the frequency spectra of the first and second baseband signals do not overlap, the first and second baseband signals might not be spectrally shifted prior to combining by the signal combiner 130. In such a scenario, the spectral placement module 110 (and optionally, the second spectral placement module 120) may receive a control signal indicating whether or not to perform spectral shifting and/or to what degree spectral shifting should be implemented.</p>

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	<p><i>See, e.g.</i>, Rofougaran at 4:16-67.</p> <p>Various components of the exemplary communication system 100 (and other communication systems illustrated and discussed herein) may be implemented in analog and/or digital circuitry. To illustrate this, the exemplary communication system 100 is not shown with analog-to-digital converters (ADCs) or digital-to-analog converters (DACs). FIGS. 4-6, to be discussed later, show various non-limiting exemplary configurations including such converters.</p> <p>FIG. 2 is a diagram showing a portion of a second non-limiting exemplary communication system 200, in accordance with various aspects of the present invention. The communication system 200 may, for example and without limitation, share any or all characteristics with the communication system 100 illustrated in FIG. 1 and discussed previously.</p> <p>The exemplary communication system 200 may comprise at least a first input 201 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to the Bluetooth communication protocol. FIG. 2 shows an exemplary frequency spectrum 203 associated with the first baseband signal.</p> <p>The exemplary communication system 200 may also comprise at least a second input 202 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first communication protocol discussed above). For example and without limitation, the first baseband signal may correspond to an IEEE 802.11 communication protocol (e.g., IEEE 802.11(b) or IEEE 802.11(g)). FIG. 2 shows an exemplary frequency spectrum 204 associated with the second baseband signal.</p> <p><i>See, e.g.</i>, Rofougaran at 5:64-6:31.</p>

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	<p>In a non-limiting exemplary configuration illustrated in FIG. 2, the signal combiner 230 receives a first signal from the spectral placement module 210 that is based on the spectrally shifted first baseband signal. Also, the signal combiner 230 receives a second signal that is based on the second baseband signal. In such a configuration, the signal combiner 230 combines the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the spectrally shifted first baseband signal and a second signal component based on the second baseband signal (e.g., not spectrally shifted).</p> <p>FIG. 2 shows an exemplary frequency spectrum 231 associated with the composite signal formed by the signal combiner 230. The spectrum 231 comprises a first portion 233 corresponding to the first signal component, and a second portion 232 corresponding to the second signal component. Note that the first portion 233 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 232.</p> <p>The exemplary communication system 200 may also comprise an upconverter 240 adapted to upconvert a signal (e.g., the composite signal from the signal combiner 230) for transmission. The upconverter 240 may, for example and without limitation, share any or all characteristics with the upconverter 140 discussed previously.</p> <p>The upconverter 240 may, for example, comprise a mixer 247, a local oscillator 246 and one or more filters 248. The mixer 247 may, for example, receive the composite signal from the signal combiner 230 and an RF mixing signal at frequency fRF from a local oscillator 246. The upconverter 240 may, for example, filter the upconverted signal from the mixer 247 with one or more filters 248. The output of the upconverter 240 may, for example, comprise a signal indicative of the composite signal spectrally shifted to an RF frequency.</p> <p>FIG. 2 shows an exemplary frequency spectrum 241 associated with the RF signal formed by the upconverter 240. The frequency spectrum 241 comprises a first portion 243 corresponding to the first signal component and a second portion 242 corresponding to the second signal component. Note that the first portion 243 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 242. Also note that the first portion 243 and</p>

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	<p>second portion 242 might be formed with a first mirror portion 244 and second mirror portion 245, respectively. Note that a mirror portion may either be removed or may be kept for later processing. The exemplary communication system 200 may further comprise a RF transmission stage 250 adapted to transmit an RF signal. The RF transmission stage 250 may, for example and without limitation, share any or all characteristics with the RF transmission stage 150 discussed previously. Such an RF signal may, for example, be associated with the composite signal output from the signal combiner 230 and upconverted by the upconverter 240. The RF transmission stage 250 may, for example and without limitation, comprise a power amplifier 252, antenna 254 and other components generally associated with RF signal transmission.</p> <p><i>See, e.g., Rofougaran at 6:66-7:57.</i></p> <p>For example, the spectral placement module 510, optional second spectral placement module 520 and signal combiner 530 may operate in the analog domain. The first digital-to-analog converter 592 may convert the first baseband signal to the analog domain for processing by the spectral placement module 510. The second digital-to-analog converter 594 may convert the second baseband signal to the analog domain for processing by the second spectral placement module 520 or signal combiner 530. The signal combiner 530 then combines signals in the analog domain to generate an analog composite signal, which is then upconverted and transmitted by the upconverter 540 and RF transmission stage 550, respectively.</p> <p><i>See, e.g., Rofougaran at 9:30-41.</i></p> <p>FIG. 7 is a diagram showing a portion of a seventh non-limiting exemplary communication system 700, in accordance with various aspects of the present invention. The exemplary communication system 700 may, for example and without limitation, share any or all characteristics with the exemplary systems 100-600 illustrated in FIGS. 1-6 and discussed previously.</p> <p>The exemplary communication system 700 may comprise a first mixer 744 that receives a spectrally shifted first baseband signal from the spectral placement module 710 and a first RF mixing signal (e.g., a 2.446 GHz signal generally associated with the Bluetooth communication protocol) from a</p>

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	<p>first local oscillator 742. The exemplary communication system 700 may also comprise a second mixer 748 that receives a second baseband signal (or a spectrally shifted second baseband signal) and a second RF mixing signal (e.g., a 2.486 GHz signal generally associated with the IEEE 802.11(g) communication protocol) from a second local oscillator 746.</p> <p>The exemplary communication system 700 may comprise an RF signal combiner 730 that is adapted to combine input RF signals. The RF signal combiner 730 may, for example, receive and combine the output signals from the first mixer 744 and second mixer 748 to generate an RF composite signal. The exemplary communication system 700 may also comprise a RF transmission stage 750 that receives the RF composite signal from the RF signal combiner 730 and transmit the signal.</p> <p><i>See, e.g.</i>, Rofougaran at 10:18-43.</p> <p>The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 810 comprises receiving the first baseband signal, step 810 may comprise receiving the first baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The first baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 810 may, for example, comprise generating the first baseband signal independently (e.g., corresponding to an independent communication). Step 810 may alternatively, for example, comprise generating the first baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first baseband signal and other baseband signals for a single communication).</p> <p>The exemplary method 800 may, at step 820, comprise spectrally placing (or shifting) the first baseband signal (e.g., received at step 810). Step 820 may, for example and without limitation, share any or all functional characteristics with the spectral placement modules 110-710 of the exemplary systems 100-700 illustrated in FIGS. 1-7 and discussed previously.</p>

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	<p>Step 820 may, for example, comprise spectrally shifting the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with a second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, step 820 may comprise implementing a frequency-hopping scheme with the first baseband signal. For example, in a scenario where there are one or more frequency bands (e.g., a second frequency space) associated with a second baseband signal, step 820 may comprise spectrally shifting the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p>In another non-limiting exemplary scenario, spectrally shifting the first baseband signal may result in the production of a spectral image (e.g., frequency content mirrored about a mixing frequency utilized to spectrally shift the first baseband signal). In such a scenario, step 820 may comprise accepting or rejecting the image.</p> <p>In a scenario where an image is rejected, step 820 may comprise rejecting the image in any of a variety of manners. For example and without limitation, step 820 may comprise performing image reject mixing to spectrally shift the first baseband signal. Such image reject mixing generally comprises spectrally shifting a signal and rejecting an image associated with the spectrally shifted signal. Also for example, step 820 may comprise filtering out an unwanted image. The scope of various aspects of the present invention should not be limited by the utilization of image rejection or by any particular manner of performing such image rejection.</p> <p>The exemplary method 800 may, at step 830, comprise generating and/or receiving a second baseband signal corresponding to a second communication protocol (e.g., different from the first communication protocol). Step 830 may, for example and without limitation, share any or all functional characteristics with the second input 102 of the exemplary system 100 illustrated in FIG. 1 and discussed previously.</p>

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	<p>The second baseband signal may, for example, correspond to a second communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 830 comprises receiving the second baseband signal, step 830 may comprise receiving the second baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 830 may, for example, comprise generating the second baseband signal independently (e.g., corresponding to a communication independent of a communication associated with the first baseband signal). Step 830 may alternatively, for example, comprise generating the second baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the second baseband signal and the first baseband signal for a single communication).</p> <p><i>See, e.g., Rofougaran at 11:53-13:4.</i></p> <p>Furthermore, this claim element is obvious in light of Rofougaran itself, when combined with any of the other references as charted for this claim element in Exs. A-1–A-31, First Supplemental Ex. A-Obviousness Chart, and/or when combined with the knowledge of one of ordinary skill in the art. Motivations to combine may come from the knowledge of the person of ordinary skill themselves, or from the known problems and predictable solutions as embodied in these references. Further motivations to combine references and additional details may be found in the Cover Pleading and First Supplemental Ex. A-Obviousness Chart.</p>
[10.7] up-converting the second analog signal to a second RF center frequency greater than the first center RF frequency to produce a second up-converted analog signal, wherein the second up-converted analog signal	Rofougaran discloses “up-converting the second analog signal to a second RF center frequency greater than the first center RF frequency to produce a second up-converted analog signal, wherein the second up-converted analog signal comprises a second up-converted frequency range from the second RF center frequency minus one-half the second frequency range to the second RF center frequency plus one-half the second frequency range, and wherein a frequency difference between the first RF center frequency and the second RF center frequency is greater than the sum of one-half the first frequency range and one-half the second frequency range.” See, e.g.:

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<p>comprises a second up-converted frequency range from the second RF center frequency minus one-half the second frequency range to the second RF center frequency plus one-half the second frequency range, and wherein a frequency difference between the first RF center frequency and the second RF center frequency is greater than the sum of one-half the first frequency range and one-half the second frequency range;</p>	<p>Figure 2</p> <p>See, e.g., Rofougaran at Figure 2.</p>

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	<p>Figure 5</p> <p>See, e.g., Rofougaran at Figure 5.</p>

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	<p>The diagram illustrates a communication system architecture. It starts with two baseband signal inputs: 'First Baseband Signal' and 'Second Baseband Signal'. The 'First Baseband Signal' is processed by a 'Spectral Placement Module' (710). This module is connected to a local oscillator 'LO1' (e.g., 2.446 GHz) via a mixer (744). The output of this mixer is then sent to an 'RF Signal Combiner' (730). The 'Second Baseband Signal' is processed by an 'Optional Second Spectral Placement Module' (720). This module is connected to a local oscillator 'LO2' (e.g., 2.486 GHz) via a mixer (748). The output of this mixer is also sent to the 'RF Signal Combiner' (730). Finally, the combined signal from the 'RF Signal Combiner' passes through an 'RF Xmit Stage' (750) before being transmitted.</p>

Figure 7

See, e.g., Rofougaran at Figure 7.

FIG. 1 is a diagram showing a portion of a first non-limiting exemplary communication system 100, in accordance with various aspects of the present invention. The communication system (or device) may comprise characteristics of any of a variety of communication systems/devices (e.g., multimode wireless communication devices). For example and without limitation, the communication system may comprise characteristics of any of a variety of mobile wireless communication devices (e.g.,

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	<p>cellular phones, paging devices, portable email devices, etc.). Also for example, the communication system may comprise characteristics of fixed communication systems or devices (e.g., network access points, base stations, satellites, wireless routers, set top boxes, etc.). Further for example, the communication system may comprise characteristics of a variety of electronic devices with wireless communication capability (e.g., televisions, music players, cameras, remote controls, personal digital assistants, handheld computers, gaming devices, etc.). Accordingly, the scope of various aspects of the present invention should not be limited by characteristics of particular communication systems or devices.</p> <p>The following discussion will, at times, refer to various communication modes. A multimode communication device may, for example, be adapted to communicate in a plurality of such communication modes. For the following discussion, a communication mode may generally be considered to coincide with communication utilizing a particular communication protocol or standard. A non-limiting list of exemplary communication protocols includes various cellular communication protocols (e.g., GSM, GPRS, EDGE, CDMA, WCDMA, TDMA, PDC, etc.), various wireless networking protocols or standards, including WLAN, WMAN, WPAN and WWAN (e.g., IEEE 802.11, Bluetooth, IEEE 802.15, UWB, IEEE 802.16, IEEE 802.20, Zigbee, any WiFi protocol, etc.), various television communication standards, etc. The scope of various aspects of the present invention should not be limited by characteristics of particular communication modes or protocols, whether standard or proprietary.</p> <p>The exemplary communication system 100 may comprise at least a first input 101 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to any of the previously mentioned communication protocols.</p> <p>The exemplary communication system 100 may also comprise at least a second input 102 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first</p>

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	<p>communication protocol discussed above). For example and without limitation, the second baseband signal may correspond to any of the previously mentioned communication protocols. The first baseband signal and the second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of the communication system 100. For example, such modules may generate the first and second baseband signals independently (e.g., corresponding to independent respective communications). Alternatively, for example, such modules may generate the first and second baseband signals in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first and second baseband signals for a single communication).</p> <p>The exemplary communication system 100 may additionally comprise a spectral placement module 110 that is adapted to spectrally shift the first baseband signal (i.e., shift the frequency spectrum of the first baseband signal). In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to spectrally shift the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with the second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to implement a frequency-hopping scheme with the first baseband signal. For example, in a scenario, where there are one or more frequency bands (e.g., a second frequency space) associated with the second baseband signal, the spectral placement module 110 may be adapted to shift the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p><i>See, e.g., Rofougaran at 2:38-3:58.</i></p> <p>The exemplary communication system 100 may also comprise a second spectral placement module 120. Such a second spectral placement module 120 may, for example, share any or all characteristics</p>

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	<p>with the spectral placement module 110 discussed previously. The incorporation of such a second spectral placement module 120 may, for example, provide spectral shifting flexibility. For example, in such an exemplary configuration, either or both of the first and second baseband signals may be spectrally shifted to substantially distinct frequency spaces. Also for example, in such an exemplary configuration, either or both of the first and second baseband signals may be frequency hopped. Note that though the second spectral placement module 120 is illustrated separate from the first spectral placement module 110, the second spectral placement module 120 may share any or all hardware and/or software components with the spectral placement module 110.</p> <p>The exemplary communication system 100 may further comprise a signal combiner 130 that is adapted to generate a composite signal comprising various input signals to the signal combiner 130. For example, the composite signal may simultaneously (i.e., at an instant in time) comprise components associated with various input signals. Note that such simultaneity need not always be present. For example, at a first instant in time, the signal output from the signal combiner 130 might comprise a plurality of components associated with a plurality of respective input signals, at a second instant in time, the signal output from the signal combiner 130 might comprise a single component associated with a single respective input signal, and at a third instant in time, the signal output from the signal combiner 130 might comprise no components.</p> <p>In a first non-limiting exemplary scenario, the signal combiner 130 may receive a first signal that is based on the first baseband signal (e.g., associated with a first communication protocol). Also, the signal combiner 130 may receive a second signal that is based on the second baseband signal (e.g., associated with a second communication protocol). In such a scenario, the signal combiner 130 may combine the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the first baseband signal and a second signal component based on the second baseband signal. In such a scenario, for example where the frequency spectra of the first and second baseband signals do not overlap, the first and second baseband signals might not be spectrally shifted prior to combining by the signal combiner 130. In such a scenario, the spectral placement module 110 (and optionally, the second spectral placement module 120) may receive a control signal indicating whether or not to perform spectral shifting and/or to what degree spectral shifting should be implemented.</p>

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	<p><i>See, e.g.</i>, Rofougaran at 4:16-67.</p> <p>Various components of the exemplary communication system 100 (and other communication systems illustrated and discussed herein) may be implemented in analog and/or digital circuitry. To illustrate this, the exemplary communication system 100 is not shown with analog-to-digital converters (ADCs) or digital-to-analog converters (DACs). FIGS. 4-6, to be discussed later, show various non-limiting exemplary configurations including such converters.</p> <p>FIG. 2 is a diagram showing a portion of a second non-limiting exemplary communication system 200, in accordance with various aspects of the present invention. The communication system 200 may, for example and without limitation, share any or all characteristics with the communication system 100 illustrated in FIG. 1 and discussed previously.</p> <p>The exemplary communication system 200 may comprise at least a first input 201 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to the Bluetooth communication protocol. FIG. 2 shows an exemplary frequency spectrum 203 associated with the first baseband signal.</p> <p>The exemplary communication system 200 may also comprise at least a second input 202 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first communication protocol discussed above). For example and without limitation, the first baseband signal may correspond to an IEEE 802.11 communication protocol (e.g., IEEE 802.11(b) or IEEE 802.11(g)). FIG. 2 shows an exemplary frequency spectrum 204 associated with the second baseband signal.</p> <p><i>See, e.g.</i>, Rofougaran at 5:64-6:31.</p>

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	<p>In a non-limiting exemplary configuration illustrated in FIG. 2, the signal combiner 230 receives a first signal from the spectral placement module 210 that is based on the spectrally shifted first baseband signal. Also, the signal combiner 230 receives a second signal that is based on the second baseband signal. In such a configuration, the signal combiner 230 combines the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the spectrally shifted first baseband signal and a second signal component based on the second baseband signal (e.g., not spectrally shifted).</p> <p>FIG. 2 shows an exemplary frequency spectrum 231 associated with the composite signal formed by the signal combiner 230. The spectrum 231 comprises a first portion 233 corresponding to the first signal component, and a second portion 232 corresponding to the second signal component. Note that the first portion 233 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 232.</p> <p>The exemplary communication system 200 may also comprise an upconverter 240 adapted to upconvert a signal (e.g., the composite signal from the signal combiner 230) for transmission. The upconverter 240 may, for example and without limitation, share any or all characteristics with the upconverter 140 discussed previously.</p> <p>The upconverter 240 may, for example, comprise a mixer 247, a local oscillator 246 and one or more filters 248. The mixer 247 may, for example, receive the composite signal from the signal combiner 230 and an RF mixing signal at frequency fRF from a local oscillator 246. The upconverter 240 may, for example, filter the upconverted signal from the mixer 247 with one or more filters 248. The output of the upconverter 240 may, for example, comprise a signal indicative of the composite signal spectrally shifted to an RF frequency.</p> <p>FIG. 2 shows an exemplary frequency spectrum 241 associated with the RF signal formed by the upconverter 240. The frequency spectrum 241 comprises a first portion 243 corresponding to the first signal component and a second portion 242 corresponding to the second signal component. Note that the first portion 243 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 242. Also note that the first portion 243 and</p>

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	<p>second portion 242 might be formed with a first mirror portion 244 and second mirror portion 245, respectively. Note that a mirror portion may either be removed or may be kept for later processing. The exemplary communication system 200 may further comprise a RF transmission stage 250 adapted to transmit an RF signal. The RF transmission stage 250 may, for example and without limitation, share any or all characteristics with the RF transmission stage 150 discussed previously. Such an RF signal may, for example, be associated with the composite signal output from the signal combiner 230 and upconverted by the upconverter 240. The RF transmission stage 250 may, for example and without limitation, comprise a power amplifier 252, antenna 254 and other components generally associated with RF signal transmission.</p> <p><i>See, e.g., Rofougaran at 6:66-7:57.</i></p> <p>For example, the spectral placement module 510, optional second spectral placement module 520 and signal combiner 530 may operate in the analog domain. The first digital-to-analog converter 592 may convert the first baseband signal to the analog domain for processing by the spectral placement module 510. The second digital-to-analog converter 594 may convert the second baseband signal to the analog domain for processing by the second spectral placement module 520 or signal combiner 530. The signal combiner 530 then combines signals in the analog domain to generate an analog composite signal, which is then upconverted and transmitted by the upconverter 540 and RF transmission stage 550, respectively.</p> <p><i>See, e.g., Rofougaran at 9:30-41.</i></p> <p>FIG. 7 is a diagram showing a portion of a seventh non-limiting exemplary communication system 700, in accordance with various aspects of the present invention. The exemplary communication system 700 may, for example and without limitation, share any or all characteristics with the exemplary systems 100-600 illustrated in FIGS. 1-6 and discussed previously.</p> <p>The exemplary communication system 700 may comprise a first mixer 744 that receives a spectrally shifted first baseband signal from the spectral placement module 710 and a first RF mixing signal (e.g., a 2.446 GHz signal generally associated with the Bluetooth communication protocol) from a</p>

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	<p>first local oscillator 742. The exemplary communication system 700 may also comprise a second mixer 748 that receives a second baseband signal (or a spectrally shifted second baseband signal) and a second RF mixing signal (e.g., a 2.486 GHz signal generally associated with the IEEE 802.11(g) communication protocol) from a second local oscillator 746.</p> <p>The exemplary communication system 700 may comprise an RF signal combiner 730 that is adapted to combine input RF signals. The RF signal combiner 730 may, for example, receive and combine the output signals from the first mixer 744 and second mixer 748 to generate an RF composite signal. The exemplary communication system 700 may also comprise a RF transmission stage 750 that receives the RF composite signal from the RF signal combiner 730 and transmit the signal.</p> <p><i>See, e.g., Rofougaran at 10:18-43.</i></p> <p>The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 810 comprises receiving the first baseband signal, step 810 may comprise receiving the first baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The first baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 810 may, for example, comprise generating the first baseband signal independently (e.g., corresponding to an independent communication). Step 810 may alternatively, for example, comprise generating the first baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first baseband signal and other baseband signals for a single communication).</p> <p>The exemplary method 800 may, at step 820, comprise spectrally placing (or shifting) the first baseband signal (e.g., received at step 810). Step 820 may, for example and without limitation, share any or all functional characteristics with the spectral placement modules 110-710 of the exemplary systems 100-700 illustrated in FIGS. 1-7 and discussed previously.</p>

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	<p>Step 820 may, for example, comprise spectrally shifting the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with a second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, step 820 may comprise implementing a frequency-hopping scheme with the first baseband signal. For example, in a scenario where there are one or more frequency bands (e.g., a second frequency space) associated with a second baseband signal, step 820 may comprise spectrally shifting the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p>In another non-limiting exemplary scenario, spectrally shifting the first baseband signal may result in the production of a spectral image (e.g., frequency content mirrored about a mixing frequency utilized to spectrally shift the first baseband signal). In such a scenario, step 820 may comprise accepting or rejecting the image.</p> <p>In a scenario where an image is rejected, step 820 may comprise rejecting the image in any of a variety of manners. For example and without limitation, step 820 may comprise performing image reject mixing to spectrally shift the first baseband signal. Such image reject mixing generally comprises spectrally shifting a signal and rejecting an image associated with the spectrally shifted signal. Also for example, step 820 may comprise filtering out an unwanted image. The scope of various aspects of the present invention should not be limited by the utilization of image rejection or by any particular manner of performing such image rejection.</p> <p>The exemplary method 800 may, at step 830, comprise generating and/or receiving a second baseband signal corresponding to a second communication protocol (e.g., different from the first communication protocol). Step 830 may, for example and without limitation, share any or all functional characteristics with the second input 102 of the exemplary system 100 illustrated in FIG. 1 and discussed previously.</p>

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	<p>The second baseband signal may, for example, correspond to a second communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 830 comprises receiving the second baseband signal, step 830 may comprise receiving the second baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 830 may, for example, comprise generating the second baseband signal independently (e.g., corresponding to a communication independent of a communication associated with the first baseband signal). Step 830 may alternatively, for example, comprise generating the second baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the second baseband signal and the first baseband signal for a single communication).</p> <p><i>See, e.g.</i>, Rofougaran at 11:53-13:4.</p> <p>Furthermore, this claim element is obvious in light of Rofougaran itself, when combined with any of the other references as charted for this claim element in Exs. A-1–A-31, First Supplemental Ex. A-Obviousness Chart, and/or when combined with the knowledge of one of ordinary skill in the art. Motivations to combine may come from the knowledge of the person of ordinary skill themselves, or from the known problems and predictable solutions as embodied in these references. Further motivations to combine references and additional details may be found in the Cover Pleading and First Supplemental Ex. A-Obviousness Chart.</p>
[10.8] combining the first up-converted analog signal and the second up-converted analog signal to produce a combined up-converted signal;	Rofougaran discloses “combining the first up-converted analog signal and the second up-converted analog signal to produce a combined up-converted signal.” See, e.g.:

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	<p>The diagram illustrates a signal processing system for spectral placement. It starts with two baseband signals: 'First Baseband Signal' (201) and 'Second Baseband Signal' (202), which are fed into a 'Spectral Placement Module' (210). This module outputs signals 211 and 212, which are positioned at frequencies $-f_s$ and f_s relative to a sampling frequency f_s. These signals are then combined by a 'Signal Combiner' (230). The combined signal 247 is fed into a local oscillator (LO) 246, which also receives a reference signal 245 from a reference source 244. The LO 246 generates a local oscillator signal 248. This signal is then processed by a power amplifier (PA) 250, which also receives a signal 252. The PA 250 outputs the final RF signal 250.</p>

Figure 2

See, e.g., Rofougaran at Figure 2.

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	<p>The diagram illustrates a signal processing system for two baseband signals. On the left, two baseband signals enter the system: the ^{1st} Baseband Signal enters a DAC labeled 592, and the 2nd Baseband Signal enters a DAC labeled 594. The outputs of these DACs feed into a Spectral Placement Module labeled 510. The output of the Spectral Placement Module 510 then enters a Signal Combiner labeled 530. The Signal Combiner 530 also receives input from an optional module, the Optional Second Spectral Placement Module labeled 520. The output of the Signal Combiner 530 goes to an Upconverter labeled 540, which then feeds into an RF Xmit Stage labeled 550. An arrow labeled 500 points to the top of the first DAC 592.</p>

Figure 5

See, e.g., Rofougaran at Figure 5.

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	<p>The diagram illustrates a communication system architecture. A 'First Baseband Signal' (700) enters a 'Spectral Placement Module' (710). Simultaneously, a 'Second Baseband Signal' (720) enters an 'Optional Second Spectral Placement Module' (720), which is indicated by a dashed-line box. The output of the first module is mixed with a local oscillator signal (LO1, e.g., 2.446 GHz) at mixer 744. The output of the second module is mixed with a local oscillator signal (LO2, e.g., 2.486 GHz) at mixer 748. The outputs from both mixers are combined at an 'RF Signal Combiner' (730) and then sent to an 'RF Xmit Stage' (750) for transmission.</p>

Figure 7

See, e.g., Rofougaran at Figure 7.

FIG. 1 is a diagram showing a portion of a first non-limiting exemplary communication system 100, in accordance with various aspects of the present invention. The communication system (or device) may comprise characteristics of any of a variety of communication systems/devices (e.g., multimode wireless communication devices). For example and without limitation, the communication system may comprise characteristics of any of a variety of mobile wireless communication devices (e.g.,

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	<p>cellular phones, paging devices, portable email devices, etc.). Also for example, the communication system may comprise characteristics of fixed communication systems or devices (e.g., network access points, base stations, satellites, wireless routers, set top boxes, etc.). Further for example, the communication system may comprise characteristics of a variety of electronic devices with wireless communication capability (e.g., televisions, music players, cameras, remote controls, personal digital assistants, handheld computers, gaming devices, etc.). Accordingly, the scope of various aspects of the present invention should not be limited by characteristics of particular communication systems or devices.</p> <p>The following discussion will, at times, refer to various communication modes. A multimode communication device may, for example, be adapted to communicate in a plurality of such communication modes. For the following discussion, a communication mode may generally be considered to coincide with communication utilizing a particular communication protocol or standard. A non-limiting list of exemplary communication protocols includes various cellular communication protocols (e.g., GSM, GPRS, EDGE, CDMA, WCDMA, TDMA, PDC, etc.), various wireless networking protocols or standards, including WLAN, WMAN, WPAN and WWAN (e.g., IEEE 802.11, Bluetooth, IEEE 802.15, UWB, IEEE 802.16, IEEE 802.20, Zigbee, any WiFi protocol, etc.), various television communication standards, etc. The scope of various aspects of the present invention should not be limited by characteristics of particular communication modes or protocols, whether standard or proprietary.</p> <p>The exemplary communication system 100 may comprise at least a first input 101 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to any of the previously mentioned communication protocols.</p> <p>The exemplary communication system 100 may also comprise at least a second input 102 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first</p>

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	<p>communication protocol discussed above). For example and without limitation, the second baseband signal may correspond to any of the previously mentioned communication protocols. The first baseband signal and the second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of the communication system 100. For example, such modules may generate the first and second baseband signals independently (e.g., corresponding to independent respective communications). Alternatively, for example, such modules may generate the first and second baseband signals in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first and second baseband signals for a single communication).</p> <p>The exemplary communication system 100 may additionally comprise a spectral placement module 110 that is adapted to spectrally shift the first baseband signal (i.e., shift the frequency spectrum of the first baseband signal). In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to spectrally shift the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with the second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to implement a frequency-hopping scheme with the first baseband signal. For example, in a scenario, where there are one or more frequency bands (e.g., a second frequency space) associated with the second baseband signal, the spectral placement module 110 may be adapted to shift the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p><i>See, e.g., Rofougaran at 2:38-3:58.</i></p> <p>The exemplary communication system 100 may also comprise a second spectral placement module 120. Such a second spectral placement module 120 may, for example, share any or all characteristics</p>

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	<p>with the spectral placement module 110 discussed previously. The incorporation of such a second spectral placement module 120 may, for example, provide spectral shifting flexibility. For example, in such an exemplary configuration, either or both of the first and second baseband signals may be spectrally shifted to substantially distinct frequency spaces. Also for example, in such an exemplary configuration, either or both of the first and second baseband signals may be frequency hopped. Note that though the second spectral placement module 120 is illustrated separate from the first spectral placement module 110, the second spectral placement module 120 may share any or all hardware and/or software components with the spectral placement module 110.</p> <p>The exemplary communication system 100 may further comprise a signal combiner 130 that is adapted to generate a composite signal comprising various input signals to the signal combiner 130. For example, the composite signal may simultaneously (i.e., at an instant in time) comprise components associated with various input signals. Note that such simultaneity need not always be present. For example, at a first instant in time, the signal output from the signal combiner 130 might comprise a plurality of components associated with a plurality of respective input signals, at a second instant in time, the signal output from the signal combiner 130 might comprise a single component associated with a single respective input signal, and at a third instant in time, the signal output from the signal combiner 130 might comprise no components.</p> <p>In a first non-limiting exemplary scenario, the signal combiner 130 may receive a first signal that is based on the first baseband signal (e.g., associated with a first communication protocol). Also, the signal combiner 130 may receive a second signal that is based on the second baseband signal (e.g., associated with a second communication protocol). In such a scenario, the signal combiner 130 may combine the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the first baseband signal and a second signal component based on the second baseband signal. In such a scenario, for example where the frequency spectra of the first and second baseband signals do not overlap, the first and second baseband signals might not be spectrally shifted prior to combining by the signal combiner 130. In such a scenario, the spectral placement module 110 (and optionally, the second spectral placement module 120) may receive a control signal indicating whether or not to perform spectral shifting and/or to what degree spectral shifting should be implemented.</p>

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	<p><i>See, e.g.</i>, Rofougaran at 4:16-67.</p> <p>Various components of the exemplary communication system 100 (and other communication systems illustrated and discussed herein) may be implemented in analog and/or digital circuitry. To illustrate this, the exemplary communication system 100 is not shown with analog-to-digital converters (ADCs) or digital-to-analog converters (DACs). FIGS. 4-6, to be discussed later, show various non-limiting exemplary configurations including such converters.</p> <p>FIG. 2 is a diagram showing a portion of a second non-limiting exemplary communication system 200, in accordance with various aspects of the present invention. The communication system 200 may, for example and without limitation, share any or all characteristics with the communication system 100 illustrated in FIG. 1 and discussed previously.</p> <p>The exemplary communication system 200 may comprise at least a first input 201 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to the Bluetooth communication protocol. FIG. 2 shows an exemplary frequency spectrum 203 associated with the first baseband signal.</p> <p>The exemplary communication system 200 may also comprise at least a second input 202 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first communication protocol discussed above). For example and without limitation, the first baseband signal may correspond to an IEEE 802.11 communication protocol (e.g., IEEE 802.11(b) or IEEE 802.11(g)). FIG. 2 shows an exemplary frequency spectrum 204 associated with the second baseband signal.</p> <p><i>See, e.g.</i>, Rofougaran at 5:64-6:31.</p>

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	<p>In a non-limiting exemplary configuration illustrated in FIG. 2, the signal combiner 230 receives a first signal from the spectral placement module 210 that is based on the spectrally shifted first baseband signal. Also, the signal combiner 230 receives a second signal that is based on the second baseband signal. In such a configuration, the signal combiner 230 combines the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the spectrally shifted first baseband signal and a second signal component based on the second baseband signal (e.g., not spectrally shifted).</p> <p>FIG. 2 shows an exemplary frequency spectrum 231 associated with the composite signal formed by the signal combiner 230. The spectrum 231 comprises a first portion 233 corresponding to the first signal component, and a second portion 232 corresponding to the second signal component. Note that the first portion 233 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 232.</p> <p>The exemplary communication system 200 may also comprise an upconverter 240 adapted to upconvert a signal (e.g., the composite signal from the signal combiner 230) for transmission. The upconverter 240 may, for example and without limitation, share any or all characteristics with the upconverter 140 discussed previously.</p> <p>The upconverter 240 may, for example, comprise a mixer 247, a local oscillator 246 and one or more filters 248. The mixer 247 may, for example, receive the composite signal from the signal combiner 230 and an RF mixing signal at frequency fRF from a local oscillator 246. The upconverter 240 may, for example, filter the upconverted signal from the mixer 247 with one or more filters 248. The output of the upconverter 240 may, for example, comprise a signal indicative of the composite signal spectrally shifted to an RF frequency.</p> <p>FIG. 2 shows an exemplary frequency spectrum 241 associated with the RF signal formed by the upconverter 240. The frequency spectrum 241 comprises a first portion 243 corresponding to the first signal component and a second portion 242 corresponding to the second signal component. Note that the first portion 243 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 242. Also note that the first portion 243 and</p>

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	<p>second portion 242 might be formed with a first mirror portion 244 and second mirror portion 245, respectively. Note that a mirror portion may either be removed or may be kept for later processing. The exemplary communication system 200 may further comprise a RF transmission stage 250 adapted to transmit an RF signal. The RF transmission stage 250 may, for example and without limitation, share any or all characteristics with the RF transmission stage 150 discussed previously. Such an RF signal may, for example, be associated with the composite signal output from the signal combiner 230 and upconverted by the upconverter 240. The RF transmission stage 250 may, for example and without limitation, comprise a power amplifier 252, antenna 254 and other components generally associated with RF signal transmission.</p> <p><i>See, e.g., Rofougaran at 6:66-7:57.</i></p> <p>For example, the spectral placement module 510, optional second spectral placement module 520 and signal combiner 530 may operate in the analog domain. The first digital-to-analog converter 592 may convert the first baseband signal to the analog domain for processing by the spectral placement module 510. The second digital-to-analog converter 594 may convert the second baseband signal to the analog domain for processing by the second spectral placement module 520 or signal combiner 530. The signal combiner 530 then combines signals in the analog domain to generate an analog composite signal, which is then upconverted and transmitted by the upconverter 540 and RF transmission stage 550, respectively.</p> <p><i>See, e.g., Rofougaran at 9:30-41.</i></p> <p>FIG. 7 is a diagram showing a portion of a seventh non-limiting exemplary communication system 700, in accordance with various aspects of the present invention. The exemplary communication system 700 may, for example and without limitation, share any or all characteristics with the exemplary systems 100-600 illustrated in FIGS. 1-6 and discussed previously.</p> <p>The exemplary communication system 700 may comprise a first mixer 744 that receives a spectrally shifted first baseband signal from the spectral placement module 710 and a first RF mixing signal (e.g., a 2.446 GHz signal generally associated with the Bluetooth communication protocol) from a</p>

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	<p>first local oscillator 742. The exemplary communication system 700 may also comprise a second mixer 748 that receives a second baseband signal (or a spectrally shifted second baseband signal) and a second RF mixing signal (e.g., a 2.486 GHz signal generally associated with the IEEE 802.11(g) communication protocol) from a second local oscillator 746.</p> <p>The exemplary communication system 700 may comprise an RF signal combiner 730 that is adapted to combine input RF signals. The RF signal combiner 730 may, for example, receive and combine the output signals from the first mixer 744 and second mixer 748 to generate an RF composite signal. The exemplary communication system 700 may also comprise a RF transmission stage 750 that receives the RF composite signal from the RF signal combiner 730 and transmit the signal.</p> <p><i>See, e.g., Rofougaran at 10:18-43.</i></p> <p>The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 810 comprises receiving the first baseband signal, step 810 may comprise receiving the first baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The first baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 810 may, for example, comprise generating the first baseband signal independently (e.g., corresponding to an independent communication). Step 810 may alternatively, for example, comprise generating the first baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first baseband signal and other baseband signals for a single communication).</p> <p>The exemplary method 800 may, at step 820, comprise spectrally placing (or shifting) the first baseband signal (e.g., received at step 810). Step 820 may, for example and without limitation, share any or all functional characteristics with the spectral placement modules 110-710 of the exemplary systems 100-700 illustrated in FIGS. 1-7 and discussed previously.</p>

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	<p>Step 820 may, for example, comprise spectrally shifting the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with a second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, step 820 may comprise implementing a frequency-hopping scheme with the first baseband signal. For example, in a scenario where there are one or more frequency bands (e.g., a second frequency space) associated with a second baseband signal, step 820 may comprise spectrally shifting the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p>In another non-limiting exemplary scenario, spectrally shifting the first baseband signal may result in the production of a spectral image (e.g., frequency content mirrored about a mixing frequency utilized to spectrally shift the first baseband signal). In such a scenario, step 820 may comprise accepting or rejecting the image.</p> <p>In a scenario where an image is rejected, step 820 may comprise rejecting the image in any of a variety of manners. For example and without limitation, step 820 may comprise performing image reject mixing to spectrally shift the first baseband signal. Such image reject mixing generally comprises spectrally shifting a signal and rejecting an image associated with the spectrally shifted signal. Also for example, step 820 may comprise filtering out an unwanted image. The scope of various aspects of the present invention should not be limited by the utilization of image rejection or by any particular manner of performing such image rejection.</p> <p>The exemplary method 800 may, at step 830, comprise generating and/or receiving a second baseband signal corresponding to a second communication protocol (e.g., different from the first communication protocol). Step 830 may, for example and without limitation, share any or all functional characteristics with the second input 102 of the exemplary system 100 illustrated in FIG. 1 and discussed previously.</p>

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	<p>The second baseband signal may, for example, correspond to a second communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 830 comprises receiving the second baseband signal, step 830 may comprise receiving the second baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 830 may, for example, comprise generating the second baseband signal independently (e.g., corresponding to a communication independent of a communication associated with the first baseband signal). Step 830 may alternatively, for example, comprise generating the second baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the second baseband signal and the first baseband signal for a single communication).</p> <p><i>See, e.g.,</i> Rofougaran at 11:53-13:4.</p> <p>Furthermore, this claim element is obvious in light of Rofougaran itself, when combined with any of the other references as charted for this claim element in Exs. A-1–A-31, First Supplemental Ex. A-Obviousness Chart, and/or when combined with the knowledge of one of ordinary skill in the art. Motivations to combine may come from the knowledge of the person of ordinary skill themselves, or from the known problems and predictable solutions as embodied in these references. Further motivations to combine references and additional details may be found in the Cover Pleading and First Supplemental Ex. A-Obviousness Chart.</p>
[10.9] amplifying the combined up-converted signal in a power amplifier resulting in an amplified combined up-converted signal; and	Rofougaran discloses “amplifying the combined up-converted signal in a power amplifier resulting in an amplified combined up-converted signal.” See, e.g.:

Claim 10 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>The diagram illustrates a signal processing system for spectral placement. It starts with two baseband signals: 'First Baseband Signal' (201) and 'Second Baseband Signal' (202), which are fed into a 'Spectral Placement Module' (210). This module outputs signals 211 and 212, which are positioned at frequencies $-f_s$ and f_s relative to a sampling frequency f_s. These signals are then combined by a 'Signal Combiner' (230). The combined signal 247 is fed into a local oscillator (LO) 246, which also receives a reference signal 245 from a reference source 244. The LO 246 generates a local oscillator signal 248. This signal is then processed by a power amplifier (PA) 250, which also receives a signal 241. The PA 250 outputs the final signal 252.</p>

Figure 2

See, e.g., Rofougaran at Figure 2.

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	<p>The diagram illustrates a signal processing chain for RF transmission. It begins with two baseband signals: the 1st Baseband Signal and the 2nd Baseband Signal. These signals are processed by two DACs (Digital-to-Analog Converters), labeled 592 and 594. The outputs of the DACs are fed into a Spectral Placement Module (510) and an optional second spectral placement module (520). The outputs from the modules are combined at a Signal Combiner (530). The combined signal then passes through an Upconverter (540) and an RF Xmit Stage (550) before being transmitted.</p>

Figure 5

See, e.g., Rofougaran at Figure 5.

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	<p>Figure 7</p> <p>See, e.g., Rofougaran at Figure 7.</p> <p>FIG. 1 is a diagram showing a portion of a first non-limiting exemplary communication system 100, in accordance with various aspects of the present invention. The communication system (or device) may comprise characteristics of any of a variety of communication systems/devices (e.g., multimode wireless communication devices). For example and without limitation, the communication system may comprise characteristics of any of a variety of mobile wireless communication devices (e.g.,</p>

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	<p>cellular phones, paging devices, portable email devices, etc.). Also for example, the communication system may comprise characteristics of fixed communication systems or devices (e.g., network access points, base stations, satellites, wireless routers, set top boxes, etc.). Further for example, the communication system may comprise characteristics of a variety of electronic devices with wireless communication capability (e.g., televisions, music players, cameras, remote controls, personal digital assistants, handheld computers, gaming devices, etc.). Accordingly, the scope of various aspects of the present invention should not be limited by characteristics of particular communication systems or devices.</p> <p>The following discussion will, at times, refer to various communication modes. A multimode communication device may, for example, be adapted to communicate in a plurality of such communication modes. For the following discussion, a communication mode may generally be considered to coincide with communication utilizing a particular communication protocol or standard. A non-limiting list of exemplary communication protocols includes various cellular communication protocols (e.g., GSM, GPRS, EDGE, CDMA, WCDMA, TDMA, PDC, etc.), various wireless networking protocols or standards, including WLAN, WMAN, WPAN and WWAN (e.g., IEEE 802.11, Bluetooth, IEEE 802.15, UWB, IEEE 802.16, IEEE 802.20, Zigbee, any WiFi protocol, etc.), various television communication standards, etc. The scope of various aspects of the present invention should not be limited by characteristics of particular communication modes or protocols, whether standard or proprietary.</p> <p>The exemplary communication system 100 may comprise at least a first input 101 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to any of the previously mentioned communication protocols.</p> <p>The exemplary communication system 100 may also comprise at least a second input 102 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first</p>

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	<p>communication protocol discussed above). For example and without limitation, the second baseband signal may correspond to any of the previously mentioned communication protocols. The first baseband signal and the second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of the communication system 100. For example, such modules may generate the first and second baseband signals independently (e.g., corresponding to independent respective communications). Alternatively, for example, such modules may generate the first and second baseband signals in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first and second baseband signals for a single communication).</p> <p>The exemplary communication system 100 may additionally comprise a spectral placement module 110 that is adapted to spectrally shift the first baseband signal (i.e., shift the frequency spectrum of the first baseband signal). In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to spectrally shift the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with the second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to implement a frequency-hopping scheme with the first baseband signal. For example, in a scenario, where there are one or more frequency bands (e.g., a second frequency space) associated with the second baseband signal, the spectral placement module 110 may be adapted to shift the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p><i>See, e.g., Rofougaran at 2:38-3:58.</i></p> <p>The exemplary communication system 100 may also comprise a second spectral placement module 120. Such a second spectral placement module 120 may, for example, share any or all characteristics</p>

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	<p>with the spectral placement module 110 discussed previously. The incorporation of such a second spectral placement module 120 may, for example, provide spectral shifting flexibility. For example, in such an exemplary configuration, either or both of the first and second baseband signals may be spectrally shifted to substantially distinct frequency spaces. Also for example, in such an exemplary configuration, either or both of the first and second baseband signals may be frequency hopped. Note that though the second spectral placement module 120 is illustrated separate from the first spectral placement module 110, the second spectral placement module 120 may share any or all hardware and/or software components with the spectral placement module 110.</p> <p>The exemplary communication system 100 may further comprise a signal combiner 130 that is adapted to generate a composite signal comprising various input signals to the signal combiner 130. For example, the composite signal may simultaneously (i.e., at an instant in time) comprise components associated with various input signals. Note that such simultaneity need not always be present. For example, at a first instant in time, the signal output from the signal combiner 130 might comprise a plurality of components associated with a plurality of respective input signals, at a second instant in time, the signal output from the signal combiner 130 might comprise a single component associated with a single respective input signal, and at a third instant in time, the signal output from the signal combiner 130 might comprise no components.</p> <p>In a first non-limiting exemplary scenario, the signal combiner 130 may receive a first signal that is based on the first baseband signal (e.g., associated with a first communication protocol). Also, the signal combiner 130 may receive a second signal that is based on the second baseband signal (e.g., associated with a second communication protocol). In such a scenario, the signal combiner 130 may combine the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the first baseband signal and a second signal component based on the second baseband signal. In such a scenario, for example where the frequency spectra of the first and second baseband signals do not overlap, the first and second baseband signals might not be spectrally shifted prior to combining by the signal combiner 130. In such a scenario, the spectral placement module 110 (and optionally, the second spectral placement module 120) may receive a control signal indicating whether or not to perform spectral shifting and/or to what degree spectral shifting should be implemented.</p>

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	<p><i>See, e.g.</i>, Rofougaran at 4:16-67.</p> <p>Various components of the exemplary communication system 100 (and other communication systems illustrated and discussed herein) may be implemented in analog and/or digital circuitry. To illustrate this, the exemplary communication system 100 is not shown with analog-to-digital converters (ADCs) or digital-to-analog converters (DACs). FIGS. 4-6, to be discussed later, show various non-limiting exemplary configurations including such converters.</p> <p>FIG. 2 is a diagram showing a portion of a second non-limiting exemplary communication system 200, in accordance with various aspects of the present invention. The communication system 200 may, for example and without limitation, share any or all characteristics with the communication system 100 illustrated in FIG. 1 and discussed previously.</p> <p>The exemplary communication system 200 may comprise at least a first input 201 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to the Bluetooth communication protocol. FIG. 2 shows an exemplary frequency spectrum 203 associated with the first baseband signal.</p> <p>The exemplary communication system 200 may also comprise at least a second input 202 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first communication protocol discussed above). For example and without limitation, the first baseband signal may correspond to an IEEE 802.11 communication protocol (e.g., IEEE 802.11(b) or IEEE 802.11(g)). FIG. 2 shows an exemplary frequency spectrum 204 associated with the second baseband signal.</p> <p><i>See, e.g.</i>, Rofougaran at 5:64-6:31.</p>

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	<p>In a non-limiting exemplary configuration illustrated in FIG. 2, the signal combiner 230 receives a first signal from the spectral placement module 210 that is based on the spectrally shifted first baseband signal. Also, the signal combiner 230 receives a second signal that is based on the second baseband signal. In such a configuration, the signal combiner 230 combines the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the spectrally shifted first baseband signal and a second signal component based on the second baseband signal (e.g., not spectrally shifted).</p> <p>FIG. 2 shows an exemplary frequency spectrum 231 associated with the composite signal formed by the signal combiner 230. The spectrum 231 comprises a first portion 233 corresponding to the first signal component, and a second portion 232 corresponding to the second signal component. Note that the first portion 233 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 232.</p> <p>The exemplary communication system 200 may also comprise an upconverter 240 adapted to upconvert a signal (e.g., the composite signal from the signal combiner 230) for transmission. The upconverter 240 may, for example and without limitation, share any or all characteristics with the upconverter 140 discussed previously.</p> <p>The upconverter 240 may, for example, comprise a mixer 247, a local oscillator 246 and one or more filters 248. The mixer 247 may, for example, receive the composite signal from the signal combiner 230 and an RF mixing signal at frequency fRF from a local oscillator 246. The upconverter 240 may, for example, filter the upconverted signal from the mixer 247 with one or more filters 248. The output of the upconverter 240 may, for example, comprise a signal indicative of the composite signal spectrally shifted to an RF frequency.</p> <p>FIG. 2 shows an exemplary frequency spectrum 241 associated with the RF signal formed by the upconverter 240. The frequency spectrum 241 comprises a first portion 243 corresponding to the first signal component and a second portion 242 corresponding to the second signal component. Note that the first portion 243 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 242. Also note that the first portion 243 and</p>

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	<p>second portion 242 might be formed with a first mirror portion 244 and second mirror portion 245, respectively. Note that a mirror portion may either be removed or may be kept for later processing. The exemplary communication system 200 may further comprise a RF transmission stage 250 adapted to transmit an RF signal. The RF transmission stage 250 may, for example and without limitation, share any or all characteristics with the RF transmission stage 150 discussed previously. Such an RF signal may, for example, be associated with the composite signal output from the signal combiner 230 and upconverted by the upconverter 240. The RF transmission stage 250 may, for example and without limitation, comprise a power amplifier 252, antenna 254 and other components generally associated with RF signal transmission.</p> <p><i>See, e.g., Rofougaran at 6:66-7:57.</i></p> <p>For example, the spectral placement module 510, optional second spectral placement module 520 and signal combiner 530 may operate in the analog domain. The first digital-to-analog converter 592 may convert the first baseband signal to the analog domain for processing by the spectral placement module 510. The second digital-to-analog converter 594 may convert the second baseband signal to the analog domain for processing by the second spectral placement module 520 or signal combiner 530. The signal combiner 530 then combines signals in the analog domain to generate an analog composite signal, which is then upconverted and transmitted by the upconverter 540 and RF transmission stage 550, respectively.</p> <p><i>See, e.g., Rofougaran at 9:30-41.</i></p> <p>FIG. 7 is a diagram showing a portion of a seventh non-limiting exemplary communication system 700, in accordance with various aspects of the present invention. The exemplary communication system 700 may, for example and without limitation, share any or all characteristics with the exemplary systems 100-600 illustrated in FIGS. 1-6 and discussed previously.</p> <p>The exemplary communication system 700 may comprise a first mixer 744 that receives a spectrally shifted first baseband signal from the spectral placement module 710 and a first RF mixing signal (e.g., a 2.446 GHz signal generally associated with the Bluetooth communication protocol) from a</p>

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	<p>first local oscillator 742. The exemplary communication system 700 may also comprise a second mixer 748 that receives a second baseband signal (or a spectrally shifted second baseband signal) and a second RF mixing signal (e.g., a 2.486 GHz signal generally associated with the IEEE 802.11(g) communication protocol) from a second local oscillator 746.</p> <p>The exemplary communication system 700 may comprise an RF signal combiner 730 that is adapted to combine input RF signals. The RF signal combiner 730 may, for example, receive and combine the output signals from the first mixer 744 and second mixer 748 to generate an RF composite signal. The exemplary communication system 700 may also comprise a RF transmission stage 750 that receives the RF composite signal from the RF signal combiner 730 and transmit the signal.</p> <p><i>See, e.g., Rofougaran at 10:18-43.</i></p> <p>The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 810 comprises receiving the first baseband signal, step 810 may comprise receiving the first baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The first baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 810 may, for example, comprise generating the first baseband signal independently (e.g., corresponding to an independent communication). Step 810 may alternatively, for example, comprise generating the first baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first baseband signal and other baseband signals for a single communication).</p> <p>The exemplary method 800 may, at step 820, comprise spectrally placing (or shifting) the first baseband signal (e.g., received at step 810). Step 820 may, for example and without limitation, share any or all functional characteristics with the spectral placement modules 110-710 of the exemplary systems 100-700 illustrated in FIGS. 1-7 and discussed previously.</p>

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	<p>Step 820 may, for example, comprise spectrally shifting the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with a second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, step 820 may comprise implementing a frequency-hopping scheme with the first baseband signal. For example, in a scenario where there are one or more frequency bands (e.g., a second frequency space) associated with a second baseband signal, step 820 may comprise spectrally shifting the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p>In another non-limiting exemplary scenario, spectrally shifting the first baseband signal may result in the production of a spectral image (e.g., frequency content mirrored about a mixing frequency utilized to spectrally shift the first baseband signal). In such a scenario, step 820 may comprise accepting or rejecting the image.</p> <p>In a scenario where an image is rejected, step 820 may comprise rejecting the image in any of a variety of manners. For example and without limitation, step 820 may comprise performing image reject mixing to spectrally shift the first baseband signal. Such image reject mixing generally comprises spectrally shifting a signal and rejecting an image associated with the spectrally shifted signal. Also for example, step 820 may comprise filtering out an unwanted image. The scope of various aspects of the present invention should not be limited by the utilization of image rejection or by any particular manner of performing such image rejection.</p> <p>The exemplary method 800 may, at step 830, comprise generating and/or receiving a second baseband signal corresponding to a second communication protocol (e.g., different from the first communication protocol). Step 830 may, for example and without limitation, share any or all functional characteristics with the second input 102 of the exemplary system 100 illustrated in FIG. 1 and discussed previously.</p>

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	<p>The second baseband signal may, for example, correspond to a second communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 830 comprises receiving the second baseband signal, step 830 may comprise receiving the second baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 830 may, for example, comprise generating the second baseband signal independently (e.g., corresponding to a communication independent of a communication associated with the first baseband signal). Step 830 may alternatively, for example, comprise generating the second baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the second baseband signal and the first baseband signal for a single communication).</p> <p><i>See, e.g.</i>, Rofougaran at 11:53-13:4.</p> <p>Furthermore, this claim element is obvious in light of Rofougaran itself, when combined with any of the other references as charted for this claim element in Exs. A-1–A-31, First Supplemental Ex. A-Obviousness Chart, and/or when combined with the knowledge of one of ordinary skill in the art. Motivations to combine may come from the knowledge of the person of ordinary skill themselves, or from the known problems and predictable solutions as embodied in these references. Further motivations to combine references and additional details may be found in the Cover Pleading and First Supplemental Ex. A-Obviousness Chart.</p>
[10.10] transmitting the amplified combined up-converted signal on a first antenna,	Rofougaran discloses “transmitting the amplified combined up-converted signal on a first antenna.” See, e.g.:

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	<p>The diagram illustrates a signal processing system for spectral placement. It starts with two baseband signals: 'First Baseband Signal' (201) and 'Second Baseband Signal' (202), which are fed into a 'Spectral Placement Module' (210). This module outputs signals 211 and 212, which are positioned at frequencies $-f_s$ and f_s relative to a sampling frequency f_s. These signals are then combined by a 'Signal Combiner' (230). The combined signal 247 is fed into a mixer (246) along with a 'Local Oscillator' (LO) signal 240. The mixer also receives a signal from a filter (248). The output of the mixer 247 is then processed by a power amplifier (PA) (250) and transmitted via an antenna (252). A feedback path 241 is shown, indicating a signal being sent back to the system. Frequency markers $-f_s$, f_s, $-f_{RF}$, and f_{RF} are indicated on the frequency axis.</p>

Figure 2

See, e.g., Rofougaran at Figure 2.

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	<p>Figure 5</p> <p>See, e.g., Rofougaran at Figure 5.</p>

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	<p>The diagram illustrates a communication system architecture. It begins with two input signals: a "First Baseband Signal" and a "Second Baseband Signal". The First Baseband Signal is processed by a "Spectral Placement Module" (710). This module is connected to a local oscillator "LO1" (e.g., 2.446 GHz) via a mixer (744). The output of this mixer is then sent to an "RF Signal Combiner" (730). The Second Baseband Signal is processed by an "Optional Second Spectral Placement Module" (720), which is also connected to "LO1" via a mixer (744). Additionally, the Second Baseband Signal is processed by a local oscillator "LO2" (e.g., 2.486 GHz) via a mixer (748). The output of this mixer is then sent to the "RF Signal Combiner" (730). Finally, the combined signal from the "RF Signal Combiner" passes through an "RF Xmit Stage" (750) before being transmitted.</p>

Figure 7

See, e.g., Rofougaran at Figure 7.

FIG. 1 is a diagram showing a portion of a first non-limiting exemplary communication system 100, in accordance with various aspects of the present invention. The communication system (or device) may comprise characteristics of any of a variety of communication systems/devices (e.g., multimode wireless communication devices). For example and without limitation, the communication system may comprise characteristics of any of a variety of mobile wireless communication devices (e.g.,

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	<p>cellular phones, paging devices, portable email devices, etc.). Also for example, the communication system may comprise characteristics of fixed communication systems or devices (e.g., network access points, base stations, satellites, wireless routers, set top boxes, etc.). Further for example, the communication system may comprise characteristics of a variety of electronic devices with wireless communication capability (e.g., televisions, music players, cameras, remote controls, personal digital assistants, handheld computers, gaming devices, etc.). Accordingly, the scope of various aspects of the present invention should not be limited by characteristics of particular communication systems or devices.</p> <p>The following discussion will, at times, refer to various communication modes. A multimode communication device may, for example, be adapted to communicate in a plurality of such communication modes. For the following discussion, a communication mode may generally be considered to coincide with communication utilizing a particular communication protocol or standard. A non-limiting list of exemplary communication protocols includes various cellular communication protocols (e.g., GSM, GPRS, EDGE, CDMA, WCDMA, TDMA, PDC, etc.), various wireless networking protocols or standards, including WLAN, WMAN, WPAN and WWAN (e.g., IEEE 802.11, Bluetooth, IEEE 802.15, UWB, IEEE 802.16, IEEE 802.20, Zigbee, any WiFi protocol, etc.), various television communication standards, etc. The scope of various aspects of the present invention should not be limited by characteristics of particular communication modes or protocols, whether standard or proprietary.</p> <p>The exemplary communication system 100 may comprise at least a first input 101 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to any of the previously mentioned communication protocols.</p> <p>The exemplary communication system 100 may also comprise at least a second input 102 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first</p>

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	<p>communication protocol discussed above). For example and without limitation, the second baseband signal may correspond to any of the previously mentioned communication protocols. The first baseband signal and the second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of the communication system 100. For example, such modules may generate the first and second baseband signals independently (e.g., corresponding to independent respective communications). Alternatively, for example, such modules may generate the first and second baseband signals in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first and second baseband signals for a single communication).</p> <p>The exemplary communication system 100 may additionally comprise a spectral placement module 110 that is adapted to spectrally shift the first baseband signal (i.e., shift the frequency spectrum of the first baseband signal). In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to spectrally shift the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with the second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to implement a frequency-hopping scheme with the first baseband signal. For example, in a scenario, where there are one or more frequency bands (e.g., a second frequency space) associated with the second baseband signal, the spectral placement module 110 may be adapted to shift the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p><i>See, e.g., Rofougaran at 2:38-3:58.</i></p> <p>The exemplary communication system 100 may also comprise a second spectral placement module 120. Such a second spectral placement module 120 may, for example, share any or all characteristics</p>

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	<p>with the spectral placement module 110 discussed previously. The incorporation of such a second spectral placement module 120 may, for example, provide spectral shifting flexibility. For example, in such an exemplary configuration, either or both of the first and second baseband signals may be spectrally shifted to substantially distinct frequency spaces. Also for example, in such an exemplary configuration, either or both of the first and second baseband signals may be frequency hopped. Note that though the second spectral placement module 120 is illustrated separate from the first spectral placement module 110, the second spectral placement module 120 may share any or all hardware and/or software components with the spectral placement module 110.</p> <p>The exemplary communication system 100 may further comprise a signal combiner 130 that is adapted to generate a composite signal comprising various input signals to the signal combiner 130. For example, the composite signal may simultaneously (i.e., at an instant in time) comprise components associated with various input signals. Note that such simultaneity need not always be present. For example, at a first instant in time, the signal output from the signal combiner 130 might comprise a plurality of components associated with a plurality of respective input signals, at a second instant in time, the signal output from the signal combiner 130 might comprise a single component associated with a single respective input signal, and at a third instant in time, the signal output from the signal combiner 130 might comprise no components.</p> <p>In a first non-limiting exemplary scenario, the signal combiner 130 may receive a first signal that is based on the first baseband signal (e.g., associated with a first communication protocol). Also, the signal combiner 130 may receive a second signal that is based on the second baseband signal (e.g., associated with a second communication protocol). In such a scenario, the signal combiner 130 may combine the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the first baseband signal and a second signal component based on the second baseband signal. In such a scenario, for example where the frequency spectra of the first and second baseband signals do not overlap, the first and second baseband signals might not be spectrally shifted prior to combining by the signal combiner 130. In such a scenario, the spectral placement module 110 (and optionally, the second spectral placement module 120) may receive a control signal indicating whether or not to perform spectral shifting and/or to what degree spectral shifting should be implemented.</p>

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	<p><i>See, e.g.</i>, Rofougaran at 4:16-67.</p> <p>Various components of the exemplary communication system 100 (and other communication systems illustrated and discussed herein) may be implemented in analog and/or digital circuitry. To illustrate this, the exemplary communication system 100 is not shown with analog-to-digital converters (ADCs) or digital-to-analog converters (DACs). FIGS. 4-6, to be discussed later, show various non-limiting exemplary configurations including such converters.</p> <p>FIG. 2 is a diagram showing a portion of a second non-limiting exemplary communication system 200, in accordance with various aspects of the present invention. The communication system 200 may, for example and without limitation, share any or all characteristics with the communication system 100 illustrated in FIG. 1 and discussed previously.</p> <p>The exemplary communication system 200 may comprise at least a first input 201 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to the Bluetooth communication protocol. FIG. 2 shows an exemplary frequency spectrum 203 associated with the first baseband signal.</p> <p>The exemplary communication system 200 may also comprise at least a second input 202 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first communication protocol discussed above). For example and without limitation, the first baseband signal may correspond to an IEEE 802.11 communication protocol (e.g., IEEE 802.11(b) or IEEE 802.11(g)). FIG. 2 shows an exemplary frequency spectrum 204 associated with the second baseband signal.</p> <p><i>See, e.g.</i>, Rofougaran at 5:64-6:31.</p>

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	<p>In a non-limiting exemplary configuration illustrated in FIG. 2, the signal combiner 230 receives a first signal from the spectral placement module 210 that is based on the spectrally shifted first baseband signal. Also, the signal combiner 230 receives a second signal that is based on the second baseband signal. In such a configuration, the signal combiner 230 combines the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the spectrally shifted first baseband signal and a second signal component based on the second baseband signal (e.g., not spectrally shifted).</p> <p>FIG. 2 shows an exemplary frequency spectrum 231 associated with the composite signal formed by the signal combiner 230. The spectrum 231 comprises a first portion 233 corresponding to the first signal component, and a second portion 232 corresponding to the second signal component. Note that the first portion 233 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 232.</p> <p>The exemplary communication system 200 may also comprise an upconverter 240 adapted to upconvert a signal (e.g., the composite signal from the signal combiner 230) for transmission. The upconverter 240 may, for example and without limitation, share any or all characteristics with the upconverter 140 discussed previously.</p> <p>The upconverter 240 may, for example, comprise a mixer 247, a local oscillator 246 and one or more filters 248. The mixer 247 may, for example, receive the composite signal from the signal combiner 230 and an RF mixing signal at frequency fRF from a local oscillator 246. The upconverter 240 may, for example, filter the upconverted signal from the mixer 247 with one or more filters 248. The output of the upconverter 240 may, for example, comprise a signal indicative of the composite signal spectrally shifted to an RF frequency.</p> <p>FIG. 2 shows an exemplary frequency spectrum 241 associated with the RF signal formed by the upconverter 240. The frequency spectrum 241 comprises a first portion 243 corresponding to the first signal component and a second portion 242 corresponding to the second signal component. Note that the first portion 243 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 242. Also note that the first portion 243 and</p>

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	<p>second portion 242 might be formed with a first mirror portion 244 and second mirror portion 245, respectively. Note that a mirror portion may either be removed or may be kept for later processing. The exemplary communication system 200 may further comprise a RF transmission stage 250 adapted to transmit an RF signal. The RF transmission stage 250 may, for example and without limitation, share any or all characteristics with the RF transmission stage 150 discussed previously. Such an RF signal may, for example, be associated with the composite signal output from the signal combiner 230 and upconverted by the upconverter 240. The RF transmission stage 250 may, for example and without limitation, comprise a power amplifier 252, antenna 254 and other components generally associated with RF signal transmission.</p> <p><i>See, e.g., Rofougaran at 6:66-7:57.</i></p> <p>For example, the spectral placement module 510, optional second spectral placement module 520 and signal combiner 530 may operate in the analog domain. The first digital-to-analog converter 592 may convert the first baseband signal to the analog domain for processing by the spectral placement module 510. The second digital-to-analog converter 594 may convert the second baseband signal to the analog domain for processing by the second spectral placement module 520 or signal combiner 530. The signal combiner 530 then combines signals in the analog domain to generate an analog composite signal, which is then upconverted and transmitted by the upconverter 540 and RF transmission stage 550, respectively.</p> <p><i>See, e.g., Rofougaran at 9:30-41.</i></p> <p>FIG. 7 is a diagram showing a portion of a seventh non-limiting exemplary communication system 700, in accordance with various aspects of the present invention. The exemplary communication system 700 may, for example and without limitation, share any or all characteristics with the exemplary systems 100-600 illustrated in FIGS. 1-6 and discussed previously.</p> <p>The exemplary communication system 700 may comprise a first mixer 744 that receives a spectrally shifted first baseband signal from the spectral placement module 710 and a first RF mixing signal (e.g., a 2.446 GHz signal generally associated with the Bluetooth communication protocol) from a</p>

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	<p>first local oscillator 742. The exemplary communication system 700 may also comprise a second mixer 748 that receives a second baseband signal (or a spectrally shifted second baseband signal) and a second RF mixing signal (e.g., a 2.486 GHz signal generally associated with the IEEE 802.11(g) communication protocol) from a second local oscillator 746.</p> <p>The exemplary communication system 700 may comprise an RF signal combiner 730 that is adapted to combine input RF signals. The RF signal combiner 730 may, for example, receive and combine the output signals from the first mixer 744 and second mixer 748 to generate an RF composite signal. The exemplary communication system 700 may also comprise a RF transmission stage 750 that receives the RF composite signal from the RF signal combiner 730 and transmit the signal.</p> <p><i>See, e.g., Rofougaran at 10:18-43.</i></p> <p>The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 810 comprises receiving the first baseband signal, step 810 may comprise receiving the first baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The first baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 810 may, for example, comprise generating the first baseband signal independently (e.g., corresponding to an independent communication). Step 810 may alternatively, for example, comprise generating the first baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first baseband signal and other baseband signals for a single communication).</p> <p>The exemplary method 800 may, at step 820, comprise spectrally placing (or shifting) the first baseband signal (e.g., received at step 810). Step 820 may, for example and without limitation, share any or all functional characteristics with the spectral placement modules 110-710 of the exemplary systems 100-700 illustrated in FIGS. 1-7 and discussed previously.</p>

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	<p>Step 820 may, for example, comprise spectrally shifting the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with a second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, step 820 may comprise implementing a frequency-hopping scheme with the first baseband signal. For example, in a scenario where there are one or more frequency bands (e.g., a second frequency space) associated with a second baseband signal, step 820 may comprise spectrally shifting the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p>In another non-limiting exemplary scenario, spectrally shifting the first baseband signal may result in the production of a spectral image (e.g., frequency content mirrored about a mixing frequency utilized to spectrally shift the first baseband signal). In such a scenario, step 820 may comprise accepting or rejecting the image.</p> <p>In a scenario where an image is rejected, step 820 may comprise rejecting the image in any of a variety of manners. For example and without limitation, step 820 may comprise performing image reject mixing to spectrally shift the first baseband signal. Such image reject mixing generally comprises spectrally shifting a signal and rejecting an image associated with the spectrally shifted signal. Also for example, step 820 may comprise filtering out an unwanted image. The scope of various aspects of the present invention should not be limited by the utilization of image rejection or by any particular manner of performing such image rejection.</p> <p>The exemplary method 800 may, at step 830, comprise generating and/or receiving a second baseband signal corresponding to a second communication protocol (e.g., different from the first communication protocol). Step 830 may, for example and without limitation, share any or all functional characteristics with the second input 102 of the exemplary system 100 illustrated in FIG. 1 and discussed previously.</p>

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	<p>The second baseband signal may, for example, correspond to a second communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 830 comprises receiving the second baseband signal, step 830 may comprise receiving the second baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 830 may, for example, comprise generating the second baseband signal independently (e.g., corresponding to a communication independent of a communication associated with the first baseband signal). Step 830 may alternatively, for example, comprise generating the second baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the second baseband signal and the first baseband signal for a single communication).</p> <p><i>See, e.g.</i>, Rofougaran at 11:53-13:4.</p> <p>Furthermore, this claim element is obvious in light of Rofougaran itself, when combined with any of the other references as charted for this claim element in Exs. A-1–A-31, First Supplemental Ex. A-Obviousness Chart, and/or when combined with the knowledge of one of ordinary skill in the art. Motivations to combine may come from the knowledge of the person of ordinary skill themselves, or from the known problems and predictable solutions as embodied in these references. Further motivations to combine references and additional details may be found in the Cover Pleading and First Supplemental Ex. A-Obviousness Chart.</p>
[10.11] wherein the bandwidth of said power amplifier is greater than the difference between a lowest frequency in the first up-converted frequency range and a highest frequency in the	Rofougaran discloses “wherein the bandwidth of said power amplifier is greater than the difference between a lowest frequency in the first up-converted frequency range and a highest frequency in the second up-converted frequency range.” See, e.g.:

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<p>second up-converted frequency range.</p>	<p>The diagram illustrates a signal processing system for spectral placement. It starts with two baseband signals: a First Baseband Signal (201) and a Second Baseband Signal (202). These signals are processed by a Spectral Placement Module (210), which generates three intermediate signals: 211, 212, and 213. The frequency spectrum for these signals is shown on the top frequency axis, with 211 centered at $-f_s$, 212 at f_s, and 213 at $-f_s$. The Second Baseband Signal (202) is also shown on this axis. The output of the Spectral Placement Module (210) is fed into a Signal Combiner (230). The Signal Combiner (230) also receives a Local Oscillator (LO) signal (246) and a reference signal (247). The combined signal from the combiner is then processed by a mixer (247) and a filter (248). Finally, the signal is amplified by a Power Amplifier (PA) (250) and transmitted via an antenna (252). The overall system is labeled 200. A second frequency axis at the bottom shows the final transmitted signal (241) centered at f_{RF}, with sidebands 242 and 243. The frequency axis also includes markers for $-f_s$, f_s, and f_{RF}.</p>

Figure 2

See, e.g., Rofougaran at Figure 2.

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	<p>Figure 5</p> <p>See, e.g., Rofougaran at Figure 5.</p>

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	<p>The diagram illustrates a communication system architecture. A 'First Baseband Signal' (700) enters a 'Spectral Placement Module' (710). Simultaneously, a 'Second Baseband Signal' (720) enters an 'Optional Second Spectral Placement Module' (720), which is indicated by a dashed-line box. The output of the first module is mixed with a local oscillator signal (LO1, e.g., 2.446 GHz) at mixer 744. The output of the second module is mixed with a local oscillator signal (LO2, e.g., 2.486 GHz) at mixer 748. The outputs from both mixers are combined at an 'RF Signal Combiner' (730) and then processed by an 'RF Xmit Stage' (750) before transmission.</p>

Figure 7

See, e.g., Rofougaran at Figure 7.

FIG. 1 is a diagram showing a portion of a first non-limiting exemplary communication system 100, in accordance with various aspects of the present invention. The communication system (or device) may comprise characteristics of any of a variety of communication systems/devices (e.g., multimode wireless communication devices). For example and without limitation, the communication system may comprise characteristics of any of a variety of mobile wireless communication devices (e.g.,

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	<p>cellular phones, paging devices, portable email devices, etc.). Also for example, the communication system may comprise characteristics of fixed communication systems or devices (e.g., network access points, base stations, satellites, wireless routers, set top boxes, etc.). Further for example, the communication system may comprise characteristics of a variety of electronic devices with wireless communication capability (e.g., televisions, music players, cameras, remote controls, personal digital assistants, handheld computers, gaming devices, etc.). Accordingly, the scope of various aspects of the present invention should not be limited by characteristics of particular communication systems or devices.</p> <p>The following discussion will, at times, refer to various communication modes. A multimode communication device may, for example, be adapted to communicate in a plurality of such communication modes. For the following discussion, a communication mode may generally be considered to coincide with communication utilizing a particular communication protocol or standard. A non-limiting list of exemplary communication protocols includes various cellular communication protocols (e.g., GSM, GPRS, EDGE, CDMA, WCDMA, TDMA, PDC, etc.), various wireless networking protocols or standards, including WLAN, WMAN, WPAN and WWAN (e.g., IEEE 802.11, Bluetooth, IEEE 802.15, UWB, IEEE 802.16, IEEE 802.20, Zigbee, any WiFi protocol, etc.), various television communication standards, etc. The scope of various aspects of the present invention should not be limited by characteristics of particular communication modes or protocols, whether standard or proprietary.</p> <p>The exemplary communication system 100 may comprise at least a first input 101 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to any of the previously mentioned communication protocols.</p> <p>The exemplary communication system 100 may also comprise at least a second input 102 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first</p>

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	<p>communication protocol discussed above). For example and without limitation, the second baseband signal may correspond to any of the previously mentioned communication protocols. The first baseband signal and the second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of the communication system 100. For example, such modules may generate the first and second baseband signals independently (e.g., corresponding to independent respective communications). Alternatively, for example, such modules may generate the first and second baseband signals in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first and second baseband signals for a single communication).</p> <p>The exemplary communication system 100 may additionally comprise a spectral placement module 110 that is adapted to spectrally shift the first baseband signal (i.e., shift the frequency spectrum of the first baseband signal). In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to spectrally shift the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with the second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to implement a frequency-hopping scheme with the first baseband signal. For example, in a scenario, where there are one or more frequency bands (e.g., a second frequency space) associated with the second baseband signal, the spectral placement module 110 may be adapted to shift the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p><i>See, e.g., Rofougaran at 2:38-3:58.</i></p> <p>The exemplary communication system 100 may also comprise a second spectral placement module 120. Such a second spectral placement module 120 may, for example, share any or all characteristics</p>

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	<p>with the spectral placement module 110 discussed previously. The incorporation of such a second spectral placement module 120 may, for example, provide spectral shifting flexibility. For example, in such an exemplary configuration, either or both of the first and second baseband signals may be spectrally shifted to substantially distinct frequency spaces. Also for example, in such an exemplary configuration, either or both of the first and second baseband signals may be frequency hopped. Note that though the second spectral placement module 120 is illustrated separate from the first spectral placement module 110, the second spectral placement module 120 may share any or all hardware and/or software components with the spectral placement module 110.</p> <p>The exemplary communication system 100 may further comprise a signal combiner 130 that is adapted to generate a composite signal comprising various input signals to the signal combiner 130. For example, the composite signal may simultaneously (i.e., at an instant in time) comprise components associated with various input signals. Note that such simultaneity need not always be present. For example, at a first instant in time, the signal output from the signal combiner 130 might comprise a plurality of components associated with a plurality of respective input signals, at a second instant in time, the signal output from the signal combiner 130 might comprise a single component associated with a single respective input signal, and at a third instant in time, the signal output from the signal combiner 130 might comprise no components.</p> <p>In a first non-limiting exemplary scenario, the signal combiner 130 may receive a first signal that is based on the first baseband signal (e.g., associated with a first communication protocol). Also, the signal combiner 130 may receive a second signal that is based on the second baseband signal (e.g., associated with a second communication protocol). In such a scenario, the signal combiner 130 may combine the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the first baseband signal and a second signal component based on the second baseband signal. In such a scenario, for example where the frequency spectra of the first and second baseband signals do not overlap, the first and second baseband signals might not be spectrally shifted prior to combining by the signal combiner 130. In such a scenario, the spectral placement module 110 (and optionally, the second spectral placement module 120) may receive a control signal indicating whether or not to perform spectral shifting and/or to what degree spectral shifting should be implemented.</p>

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	<p><i>See, e.g.</i>, Rofougaran at 4:16-67.</p> <p>Various components of the exemplary communication system 100 (and other communication systems illustrated and discussed herein) may be implemented in analog and/or digital circuitry. To illustrate this, the exemplary communication system 100 is not shown with analog-to-digital converters (ADCs) or digital-to-analog converters (DACs). FIGS. 4-6, to be discussed later, show various non-limiting exemplary configurations including such converters.</p> <p>FIG. 2 is a diagram showing a portion of a second non-limiting exemplary communication system 200, in accordance with various aspects of the present invention. The communication system 200 may, for example and without limitation, share any or all characteristics with the communication system 100 illustrated in FIG. 1 and discussed previously.</p> <p>The exemplary communication system 200 may comprise at least a first input 201 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to the Bluetooth communication protocol. FIG. 2 shows an exemplary frequency spectrum 203 associated with the first baseband signal.</p> <p>The exemplary communication system 200 may also comprise at least a second input 202 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first communication protocol discussed above). For example and without limitation, the first baseband signal may correspond to an IEEE 802.11 communication protocol (e.g., IEEE 802.11(b) or IEEE 802.11(g)). FIG. 2 shows an exemplary frequency spectrum 204 associated with the second baseband signal.</p> <p><i>See, e.g.</i>, Rofougaran at 5:64-6:31.</p>

Claim 10 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>In a non-limiting exemplary configuration illustrated in FIG. 2, the signal combiner 230 receives a first signal from the spectral placement module 210 that is based on the spectrally shifted first baseband signal. Also, the signal combiner 230 receives a second signal that is based on the second baseband signal. In such a configuration, the signal combiner 230 combines the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the spectrally shifted first baseband signal and a second signal component based on the second baseband signal (e.g., not spectrally shifted).</p> <p>FIG. 2 shows an exemplary frequency spectrum 231 associated with the composite signal formed by the signal combiner 230. The spectrum 231 comprises a first portion 233 corresponding to the first signal component, and a second portion 232 corresponding to the second signal component. Note that the first portion 233 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 232.</p> <p>The exemplary communication system 200 may also comprise an upconverter 240 adapted to upconvert a signal (e.g., the composite signal from the signal combiner 230) for transmission. The upconverter 240 may, for example and without limitation, share any or all characteristics with the upconverter 140 discussed previously.</p> <p>The upconverter 240 may, for example, comprise a mixer 247, a local oscillator 246 and one or more filters 248. The mixer 247 may, for example, receive the composite signal from the signal combiner 230 and an RF mixing signal at frequency fRF from a local oscillator 246. The upconverter 240 may, for example, filter the upconverted signal from the mixer 247 with one or more filters 248. The output of the upconverter 240 may, for example, comprise a signal indicative of the composite signal spectrally shifted to an RF frequency.</p> <p>FIG. 2 shows an exemplary frequency spectrum 241 associated with the RF signal formed by the upconverter 240. The frequency spectrum 241 comprises a first portion 243 corresponding to the first signal component and a second portion 242 corresponding to the second signal component. Note that the first portion 243 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 242. Also note that the first portion 243 and</p>

Claim 10 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>second portion 242 might be formed with a first mirror portion 244 and second mirror portion 245, respectively. Note that a mirror portion may either be removed or may be kept for later processing. The exemplary communication system 200 may further comprise a RF transmission stage 250 adapted to transmit an RF signal. The RF transmission stage 250 may, for example and without limitation, share any or all characteristics with the RF transmission stage 150 discussed previously. Such an RF signal may, for example, be associated with the composite signal output from the signal combiner 230 and upconverted by the upconverter 240. The RF transmission stage 250 may, for example and without limitation, comprise a power amplifier 252, antenna 254 and other components generally associated with RF signal transmission.</p> <p><i>See, e.g., Rofougaran at 6:66-7:57.</i></p> <p>For example, the spectral placement module 510, optional second spectral placement module 520 and signal combiner 530 may operate in the analog domain. The first digital-to-analog converter 592 may convert the first baseband signal to the analog domain for processing by the spectral placement module 510. The second digital-to-analog converter 594 may convert the second baseband signal to the analog domain for processing by the second spectral placement module 520 or signal combiner 530. The signal combiner 530 then combines signals in the analog domain to generate an analog composite signal, which is then upconverted and transmitted by the upconverter 540 and RF transmission stage 550, respectively.</p> <p><i>See, e.g., Rofougaran at 9:30-41.</i></p> <p>FIG. 7 is a diagram showing a portion of a seventh non-limiting exemplary communication system 700, in accordance with various aspects of the present invention. The exemplary communication system 700 may, for example and without limitation, share any or all characteristics with the exemplary systems 100-600 illustrated in FIGS. 1-6 and discussed previously.</p> <p>The exemplary communication system 700 may comprise a first mixer 744 that receives a spectrally shifted first baseband signal from the spectral placement module 710 and a first RF mixing signal (e.g., a 2.446 GHz signal generally associated with the Bluetooth communication protocol) from a</p>

Claim 10 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>first local oscillator 742. The exemplary communication system 700 may also comprise a second mixer 748 that receives a second baseband signal (or a spectrally shifted second baseband signal) and a second RF mixing signal (e.g., a 2.486 GHz signal generally associated with the IEEE 802.11(g) communication protocol) from a second local oscillator 746.</p> <p>The exemplary communication system 700 may comprise an RF signal combiner 730 that is adapted to combine input RF signals. The RF signal combiner 730 may, for example, receive and combine the output signals from the first mixer 744 and second mixer 748 to generate an RF composite signal. The exemplary communication system 700 may also comprise a RF transmission stage 750 that receives the RF composite signal from the RF signal combiner 730 and transmit the signal.</p> <p><i>See, e.g.</i>, Rofougaran at 10:18-43.</p> <p>The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 810 comprises receiving the first baseband signal, step 810 may comprise receiving the first baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The first baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 810 may, for example, comprise generating the first baseband signal independently (e.g., corresponding to an independent communication). Step 810 may alternatively, for example, comprise generating the first baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first baseband signal and other baseband signals for a single communication).</p> <p>The exemplary method 800 may, at step 820, comprise spectrally placing (or shifting) the first baseband signal (e.g., received at step 810). Step 820 may, for example and without limitation, share any or all functional characteristics with the spectral placement modules 110-710 of the exemplary systems 100-700 illustrated in FIGS. 1-7 and discussed previously.</p>

Claim 10 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>Step 820 may, for example, comprise spectrally shifting the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with a second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, step 820 may comprise implementing a frequency-hopping scheme with the first baseband signal. For example, in a scenario where there are one or more frequency bands (e.g., a second frequency space) associated with a second baseband signal, step 820 may comprise spectrally shifting the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p>In another non-limiting exemplary scenario, spectrally shifting the first baseband signal may result in the production of a spectral image (e.g., frequency content mirrored about a mixing frequency utilized to spectrally shift the first baseband signal). In such a scenario, step 820 may comprise accepting or rejecting the image.</p> <p>In a scenario where an image is rejected, step 820 may comprise rejecting the image in any of a variety of manners. For example and without limitation, step 820 may comprise performing image reject mixing to spectrally shift the first baseband signal. Such image reject mixing generally comprises spectrally shifting a signal and rejecting an image associated with the spectrally shifted signal. Also for example, step 820 may comprise filtering out an unwanted image. The scope of various aspects of the present invention should not be limited by the utilization of image rejection or by any particular manner of performing such image rejection.</p> <p>The exemplary method 800 may, at step 830, comprise generating and/or receiving a second baseband signal corresponding to a second communication protocol (e.g., different from the first communication protocol). Step 830 may, for example and without limitation, share any or all functional characteristics with the second input 102 of the exemplary system 100 illustrated in FIG. 1 and discussed previously.</p>

Claim 10 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>The second baseband signal may, for example, correspond to a second communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 830 comprises receiving the second baseband signal, step 830 may comprise receiving the second baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 830 may, for example, comprise generating the second baseband signal independently (e.g., corresponding to a communication independent of a communication associated with the first baseband signal). Step 830 may alternatively, for example, comprise generating the second baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the second baseband signal and the first baseband signal for a single communication).</p> <p><i>See, e.g.</i>, Rofougaran at 11:53-13:4.</p> <p>Furthermore, this claim element is obvious in light of Rofougaran itself, when combined with any of the other references as charted for this claim element in Exs. A-1–A-31, First Supplemental Ex. A-Obviousness Chart, and/or when combined with the knowledge of one of ordinary skill in the art. Motivations to combine may come from the knowledge of the person of ordinary skill themselves, or from the known problems and predictable solutions as embodied in these references. Further motivations to combine references and additional details may be found in the Cover Pleading and First Supplemental Ex. A-Obviousness Chart.</p>

Claim 13 of the '802 Patent	Prior Art Reference – Rofougaran
[13.1] The method of claim 10	Rofougaran discloses all the elements of claim 10 for all the reasons provided above.
[13.2] wherein the first digital signal is encoded using a first wireless protocol and the	Rofougaran discloses “wherein the first digital signal is encoded using a first wireless protocol and the second digital signal is encoded using a second wireless protocol.” See, e.g.:

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second digital signal is encoded using a second wireless protocol.	<p>FIG. 1 is a diagram showing a portion of a first non-limiting exemplary communication system 100, in accordance with various aspects of the present invention. The communication system (or device) may comprise characteristics of any of a variety of communication systems/devices (e.g., multimode wireless communication devices). For example and without limitation, the communication system may comprise characteristics of any of a variety of mobile wireless communication devices (e.g., cellular phones, paging devices, portable email devices, etc.). Also for example, the communication system may comprise characteristics of fixed communication systems or devices (e.g., network access points, base stations, satellites, wireless routers, set top boxes, etc.). Further for example, the communication system may comprise characteristics of a variety of electronic devices with wireless communication capability (e.g., televisions, music players, cameras, remote controls, personal digital assistants, handheld computers, gaming devices, etc.). Accordingly, the scope of various aspects of the present invention should not be limited by characteristics of particular communication systems or devices.</p> <p>The following discussion will, at times, refer to various communication modes. A multimode communication device may, for example, be adapted to communicate in a plurality of such communication modes. For the following discussion, a communication mode may generally be considered to coincide with communication utilizing a particular communication protocol or standard. A non-limiting list of exemplary communication protocols includes various cellular communication protocols (e.g., GSM, GPRS, EDGE, CDMA, WCDMA, TDMA, PDC, etc.), various wireless networking protocols or standards, including WLAN, WMAN, WPAN and WWAN (e.g., IEEE 802.11, Bluetooth, IEEE 802.15, UWB, IEEE 802.16, IEEE 802.20, Zigbee, any WiFi protocol, etc.), various television communication standards, etc. The scope of various aspects of the present invention should not be limited by characteristics of particular communication modes or protocols, whether standard or proprietary.</p> <p>The exemplary communication system 100 may comprise at least a first input 101 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to any of the previously mentioned communication protocols.</p>

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	<p>The exemplary communication system 100 may also comprise at least a second input 102 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first communication protocol discussed above). For example and without limitation, the second baseband signal may correspond to any of the previously mentioned communication protocols.</p> <p>The first baseband signal and the second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of the communication system 100. For example, such modules may generate the first and second baseband signals independently (e.g., corresponding to independent respective communications). Alternatively, for example, such modules may generate the first and second baseband signals in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first and second baseband signals for a single communication).</p> <p>The exemplary communication system 100 may additionally comprise a spectral placement module 110 that is adapted to spectrally shift the first baseband signal (i.e., shift the frequency spectrum of the first baseband signal). In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to spectrally shift the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with the second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to implement a frequency-hopping scheme with the first baseband signal. For example, in a scenario, where there are one or more frequency bands (e.g., a second frequency space) associated with the second baseband signal, the spectral placement module 110 may be adapted to shift the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p>

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	<p><i>See, e.g.</i>, Rofougaran at 2:38-3:58.</p> <p>The exemplary communication system 100 may also comprise a second spectral placement module 120. Such a second spectral placement module 120 may, for example, share any or all characteristics with the spectral placement module 110 discussed previously. The incorporation of such a second spectral placement module 120 may, for example, provide spectral shifting flexibility. For example, in such an exemplary configuration, either or both of the first and second baseband signals may be spectrally shifted to substantially distinct frequency spaces. Also for example, in such an exemplary configuration, either or both of the first and second baseband signals may be frequency hopped. Note that though the second spectral placement module 120 is illustrated separate from the first spectral placement module 110, the second spectral placement module 120 may share any or all hardware and/or software components with the spectral placement module 110.</p> <p>The exemplary communication system 100 may further comprise a signal combiner 130 that is adapted to generate a composite signal comprising various input signals to the signal combiner 130. For example, the composite signal may simultaneously (i.e., at an instant in time) comprise components associated with various input signals. Note that such simultaneity need not always be present. For example, at a first instant in time, the signal output from the signal combiner 130 might comprise a plurality of components associated with a plurality of respective input signals, at a second instant in time, the signal output from the signal combiner 130 might comprise a single component associated with a single respective input signal, and at a third instant in time, the signal output from the signal combiner 130 might comprise no components.</p> <p>In a first non-limiting exemplary scenario, the signal combiner 130 may receive a first signal that is based on the first baseband signal (e.g., associated with a first communication protocol). Also, the signal combiner 130 may receive a second signal that is based on the second baseband signal (e.g., associated with a second communication protocol). In such a scenario, the signal combiner 130 may combine the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the first baseband signal and a second signal component based on the second baseband signal. In such a scenario, for example where the frequency spectra of the first and second baseband signals do not overlap, the first and second</p>

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	<p>baseband signals might not be spectrally shifted prior to combining by the signal combiner 130. In such a scenario, the spectral placement module 110 (and optionally, the second spectral placement module 120) may receive a control signal indicating whether or not to perform spectral shifting and/or to what degree spectral shifting should be implemented.</p> <p><i>See, e.g., Rofougaran at 4:16-67.</i></p> <p>Various components of the exemplary communication system 100 (and other communication systems illustrated and discussed herein) may be implemented in analog and/or digital circuitry. To illustrate this, the exemplary communication system 100 is not shown with analog-to-digital converters (ADCs) or digital-to-analog converters (DACs). FIGS. 4-6, to be discussed later, show various non-limiting exemplary configurations including such converters.</p> <p>FIG. 2 is a diagram showing a portion of a second non-limiting exemplary communication system 200, in accordance with various aspects of the present invention. The communication system 200 may, for example and without limitation, share any or all characteristics with the communication system 100 illustrated in FIG. 1 and discussed previously.</p> <p>The exemplary communication system 200 may comprise at least a first input 201 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to the Bluetooth communication protocol. FIG. 2 shows an exemplary frequency spectrum 203 associated with the first baseband signal.</p> <p>The exemplary communication system 200 may also comprise at least a second input 202 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first communication protocol discussed above). For example and without limitation, the first baseband signal may correspond to an IEEE 802.11 communication protocol (e.g., IEEE 802.11(b) or IEEE</p>

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	<p>802.11(g)). FIG. 2 shows an exemplary frequency spectrum 204 associated with the second baseband signal.</p> <p><i>See, e.g., Rofougaran at 5:64-6:31.</i></p> <p>In a non-limiting exemplary configuration illustrated in FIG. 2, the signal combiner 230 receives a first signal from the spectral placement module 210 that is based on the spectrally shifted first baseband signal. Also, the signal combiner 230 receives a second signal that is based on the second baseband signal. In such a configuration, the signal combiner 230 combines the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the spectrally shifted first baseband signal and a second signal component based on the second baseband signal (e.g., not spectrally shifted).</p> <p>FIG. 2 shows an exemplary frequency spectrum 231 associated with the composite signal formed by the signal combiner 230. The spectrum 231 comprises a first portion 233 corresponding to the first signal component, and a second portion 232 corresponding to the second signal component. Note that the first portion 233 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 232.</p> <p>The exemplary communication system 200 may also comprise an upconverter 240 adapted to upconvert a signal (e.g., the composite signal from the signal combiner 230) for transmission. The upconverter 240 may, for example and without limitation, share any or all characteristics with the upconverter 140 discussed previously.</p> <p>The upconverter 240 may, for example, comprise a mixer 247, a local oscillator 246 and one or more filters 248. The mixer 247 may, for example, receive the composite signal from the signal combiner 230 and an RF mixing signal at frequency fRF from a local oscillator 246. The upconverter 240 may, for example, filter the upconverted signal from the mixer 247 with one or more filters 248. The output of the upconverter 240 may, for example, comprise a signal indicative of the composite signal spectrally shifted to an RF frequency.</p>

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	<p>FIG. 2 shows an exemplary frequency spectrum 241 associated with the RF signal formed by the upconverter 240. The frequency spectrum 241 comprises a first portion 243 corresponding to the first signal component and a second portion 242 corresponding to the second signal component. Note that the first portion 243 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 242. Also note that the first portion 243 and second portion 242 might be formed with a first mirror portion 244 and second mirror portion 245, respectively. Note that a mirror portion may either be removed or may be kept for later processing. The exemplary communication system 200 may further comprise a RF transmission stage 250 adapted to transmit an RF signal. The RF transmission stage 250 may, for example and without limitation, share any or all characteristics with the RF transmission stage 150 discussed previously. Such an RF signal may, for example, be associated with the composite signal output from the signal combiner 230 and upconverted by the upconverter 240. The RF transmission stage 250 may, for example and without limitation, comprise a power amplifier 252, antenna 254 and other components generally associated with RF signal transmission.</p> <p><i>See, e.g., Rofougaran at 6:66-7:57.</i></p> <p>For example, the spectral placement module 510, optional second spectral placement module 520 and signal combiner 530 may operate in the analog domain. The first digital-to-analog converter 592 may convert the first baseband signal to the analog domain for processing by the spectral placement module 510. The second digital-to-analog converter 594 may convert the second baseband signal to the analog domain for processing by the second spectral placement module 520 or signal combiner 530. The signal combiner 530 then combines signals in the analog domain to generate an analog composite signal, which is then upconverted and transmitted by the upconverter 540 and RF transmission stage 550, respectively.</p> <p><i>See, e.g., Rofougaran at 9:30-41.</i></p> <p>FIG. 7 is a diagram showing a portion of a seventh non-limiting exemplary communication system 700, in accordance with various aspects of the present invention. The exemplary communication</p>

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	<p>system 700 may, for example and without limitation, share any or all characteristics with the exemplary systems 100-600 illustrated in FIGS. 1-6 and discussed previously.</p> <p>The exemplary communication system 700 may comprise a first mixer 744 that receives a spectrally shifted first baseband signal from the spectral placement module 710 and a first RF mixing signal (e.g., a 2.446 GHz signal generally associated with the Bluetooth communication protocol) from a first local oscillator 742. The exemplary communication system 700 may also comprise a second mixer 748 that receives a second baseband signal (or a spectrally shifted second baseband signal) and a second RF mixing signal (e.g., a 2.486 GHz signal generally associated with the IEEE 802.11(g) communication protocol) from a second local oscillator 746.</p> <p>The exemplary communication system 700 may comprise an RF signal combiner 730 that is adapted to combine input RF signals. The RF signal combiner 730 may, for example, receive and combine the output signals from the first mixer 744 and second mixer 748 to generate an RF composite signal. The exemplary communication system 700 may also comprise a RF transmission stage 750 that receives the RF composite signal from the RF signal combiner 730 and transmit the signal.</p> <p><i>See, e.g., Rofougaran at 10:18-43.</i></p> <p>The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 810 comprises receiving the first baseband signal, step 810 may comprise receiving the first baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The first baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 810 may, for example, comprise generating the first baseband signal independently (e.g., corresponding to an independent communication). Step 810 may alternatively, for example, comprise generating the first baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first baseband signal and other baseband signals for a single communication).</p>

Claim 13 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>The exemplary method 800 may, at step 820, comprise spectrally placing (or shifting) the first baseband signal (e.g., received at step 810). Step 820 may, for example and without limitation, share any or all functional characteristics with the spectral placement modules 110-710 of the exemplary systems 100-700 illustrated in FIGS. 1-7 and discussed previously.</p> <p>Step 820 may, for example, comprise spectrally shifting the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with a second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, step 820 may comprise implementing a frequency-hopping scheme with the first baseband signal. For example, in a scenario where there are one or more frequency bands (e.g., a second frequency space) associated with a second baseband signal, step 820 may comprise spectrally shifting the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p>In another non-limiting exemplary scenario, spectrally shifting the first baseband signal may result in the production of a spectral image (e.g., frequency content mirrored about a mixing frequency utilized to spectrally shift the first baseband signal). In such a scenario, step 820 may comprise accepting or rejecting the image.</p> <p>In a scenario where an image is rejected, step 820 may comprise rejecting the image in any of a variety of manners. For example and without limitation, step 820 may comprise performing image reject mixing to spectrally shift the first baseband signal. Such image reject mixing generally comprises spectrally shifting a signal and rejecting an image associated with the spectrally shifted signal. Also for example, step 820 may comprise filtering out an unwanted image. The scope of various aspects of the present invention should not be limited by the utilization of image rejection or by any particular manner of performing such image rejection.</p>

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	<p>The exemplary method 800 may, at step 830, comprise generating and/or receiving a second baseband signal corresponding to a second communication protocol (e.g., different from the first communication protocol). Step 830 may, for example and without limitation, share any or all functional characteristics with the second input 102 of the exemplary system 100 illustrated in FIG. 1 and discussed previously.</p> <p>The second baseband signal may, for example, correspond to a second communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 830 comprises receiving the second baseband signal, step 830 may comprise receiving the second baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 830 may, for example, comprise generating the second baseband signal independently (e.g., corresponding to a communication independent of a communication associated with the first baseband signal). Step 830 may alternatively, for example, comprise generating the second baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the second baseband signal and the first baseband signal for a single communication).</p> <p><i>See, e.g., Rofougaran at 11:53-13:4.</i></p> <p>Furthermore, this claim element is obvious in light of Rofougaran itself, when combined with any of the other references as charted for this claim element in Exs. A-1–A-31, First Supplemental Ex. A-Obviousness Chart, and/or when combined with the knowledge of one of ordinary skill in the art. Motivations to combine may come from the knowledge of the person of ordinary skill themselves, or from the known problems and predictable solutions as embodied in these references. Further motivations to combine references and additional details may be found in the Cover Pleading and First Supplemental Ex. A-Obviousness Chart.</p>

Claim 14 of the '802 Patent	Prior Art Reference – Rofougaran
[14.1] The method of claim 10	Rofougaran discloses all the elements of claim 10 for all the reasons provided above.
[14.2] wherein the second data is the same as the first data, the method further comprising:	<p>Rofougaran discloses “wherein the second data is the same as the first data, the method further comprising.” See, e.g.:</p> <p>FIG. 1 is a diagram showing a portion of a first non-limiting exemplary communication system 100, in accordance with various aspects of the present invention. The communication system (or device) may comprise characteristics of any of a variety of communication systems/devices (e.g., multimode wireless communication devices). For example and without limitation, the communication system may comprise characteristics of any of a variety of mobile wireless communication devices (e.g., cellular phones, paging devices, portable email devices, etc.). Also for example, the communication system may comprise characteristics of fixed communication systems or devices (e.g., network access points, base stations, satellites, wireless routers, set top boxes, etc.). Further for example, the communication system may comprise characteristics of a variety of electronic devices with wireless communication capability (e.g., televisions, music players, cameras, remote controls, personal digital assistants, handheld computers, gaming devices, etc.). Accordingly, the scope of various aspects of the present invention should not be limited by characteristics of particular communication systems or devices.</p> <p>The following discussion will, at times, refer to various communication modes. A multimode communication device may, for example, be adapted to communicate in a plurality of such communication modes. For the following discussion, a communication mode may generally be considered to coincide with communication utilizing a particular communication protocol or standard. A non-limiting list of exemplary communication protocols includes various cellular communication protocols (e.g., GSM, GPRS, EDGE, CDMA, WCDMA, TDMA, PDC, etc.), various wireless networking protocols or standards, including WLAN, WMAN, WPAN and WWAN (e.g., IEEE 802.11, Bluetooth, IEEE 802.15, UWB, IEEE 802.16, IEEE 802.20, Zigbee, any WiFi protocol, etc.), various television communication standards, etc. The scope of various aspects of the present invention should not be limited by characteristics of particular communication modes or protocols, whether standard or proprietary.</p>

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	<p>The exemplary communication system 100 may comprise at least a first input 101 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to any of the previously mentioned communication protocols.</p> <p>The exemplary communication system 100 may also comprise at least a second input 102 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first communication protocol discussed above). For example and without limitation, the second baseband signal may correspond to any of the previously mentioned communication protocols.</p> <p>The first baseband signal and the second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of the communication system 100. For example, such modules may generate the first and second baseband signals independently (e.g., corresponding to independent respective communications). Alternatively, for example, such modules may generate the first and second baseband signals in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first and second baseband signals for a single communication).</p> <p>The exemplary communication system 100 may additionally comprise a spectral placement module 110 that is adapted to spectrally shift the first baseband signal (i.e., shift the frequency spectrum of the first baseband signal). In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to spectrally shift the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with the second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to implement a frequency-hopping scheme with the first baseband signal. For example, in a scenario,</p>

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	<p>where there are one or more frequency bands (e.g., a second frequency space) associated with the second baseband signal, the spectral placement module 110 may be adapted to shift the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p><i>See, e.g., Rofougaran at 2:38-3:58.</i></p> <p>The exemplary communication system 100 may also comprise a second spectral placement module 120. Such a second spectral placement module 120 may, for example, share any or all characteristics with the spectral placement module 110 discussed previously. The incorporation of such a second spectral placement module 120 may, for example, provide spectral shifting flexibility. For example, in such an exemplary configuration, either or both of the first and second baseband signals may be spectrally shifted to substantially distinct frequency spaces. Also for example, in such an exemplary configuration, either or both of the first and second baseband signals may be frequency hopped. Note that though the second spectral placement module 120 is illustrated separate from the first spectral placement module 110, the second spectral placement module 120 may share any or all hardware and/or software components with the spectral placement module 110.</p> <p>The exemplary communication system 100 may further comprise a signal combiner 130 that is adapted to generate a composite signal comprising various input signals to the signal combiner 130. For example, the composite signal may simultaneously (i.e., at an instant in time) comprise components associated with various input signals. Note that such simultaneity need not always be present. For example, at a first instant in time, the signal output from the signal combiner 130 might comprise a plurality of components associated with a plurality of respective input signals, at a second instant in time, the signal output from the signal combiner 130 might comprise a single component associated with a single respective input signal, and at a third instant in time, the signal output from the signal combiner 130 might comprise no components.</p> <p>In a first non-limiting exemplary scenario, the signal combiner 130 may receive a first signal that is based on the first baseband signal (e.g., associated with a first communication protocol). Also, the signal combiner 130 may receive a second signal that is based on the second baseband signal (e.g.,</p>

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	<p>associated with a second communication protocol). In such a scenario, the signal combiner 130 may combine the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the first baseband signal and a second signal component based on the second baseband signal. In such a scenario, for example where the frequency spectra of the first and second baseband signals do not overlap, the first and second baseband signals might not be spectrally shifted prior to combining by the signal combiner 130. In such a scenario, the spectral placement module 110 (and optionally, the second spectral placement module 120) may receive a control signal indicating whether or not to perform spectral shifting and/or to what degree spectral shifting should be implemented.</p> <p><i>See, e.g., Rofougaran at 4:16-67.</i></p> <p>Various components of the exemplary communication system 100 (and other communication systems illustrated and discussed herein) may be implemented in analog and/or digital circuitry. To illustrate this, the exemplary communication system 100 is not shown with analog-to-digital converters (ADCs) or digital-to-analog converters (DACs). FIGS. 4-6, to be discussed later, show various non-limiting exemplary configurations including such converters.</p> <p>FIG. 2 is a diagram showing a portion of a second non-limiting exemplary communication system 200, in accordance with various aspects of the present invention. The communication system 200 may, for example and without limitation, share any or all characteristics with the communication system 100 illustrated in FIG. 1 and discussed previously.</p> <p>The exemplary communication system 200 may comprise at least a first input 201 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to the Bluetooth communication protocol. FIG. 2 shows an exemplary frequency spectrum 203 associated with the first baseband signal.</p>

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	<p>The exemplary communication system 200 may also comprise at least a second input 202 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first communication protocol discussed above). For example and without limitation, the first baseband signal may correspond to an IEEE 802.11 communication protocol (e.g., IEEE 802.11(b) or IEEE 802.11(g)). FIG. 2 shows an exemplary frequency spectrum 204 associated with the second baseband signal.</p> <p><i>See, e.g., Rofougaran at 5:64-6:31.</i></p> <p>In a non-limiting exemplary configuration illustrated in FIG. 2, the signal combiner 230 receives a first signal from the spectral placement module 210 that is based on the spectrally shifted first baseband signal. Also, the signal combiner 230 receives a second signal that is based on the second baseband signal. In such a configuration, the signal combiner 230 combines the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the spectrally shifted first baseband signal and a second signal component based on the second baseband signal (e.g., not spectrally shifted).</p> <p>FIG. 2 shows an exemplary frequency spectrum 231 associated with the composite signal formed by the signal combiner 230. The spectrum 231 comprises a first portion 233 corresponding to the first signal component, and a second portion 232 corresponding to the second signal component. Note that the first portion 233 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 232.</p> <p>The exemplary communication system 200 may also comprise an upconverter 240 adapted to upconvert a signal (e.g., the composite signal from the signal combiner 230) for transmission. The upconverter 240 may, for example and without limitation, share any or all characteristics with the upconverter 140 discussed previously.</p> <p>The upconverter 240 may, for example, comprise a mixer 247, a local oscillator 246 and one or more filters 248. The mixer 247 may, for example, receive the composite signal from the signal combiner</p>

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	<p>230 and an RF mixing signal at frequency fRF from a local oscillator 246. The upconverter 240 may, for example, filter the upconverted signal from the mixer 247 with one or more filters 248. The output of the upconverter 240 may, for example, comprise a signal indicative of the composite signal spectrally shifted to an RF frequency.</p> <p>FIG. 2 shows an exemplary frequency spectrum 241 associated with the RF signal formed by the upconverter 240. The frequency spectrum 241 comprises a first portion 243 corresponding to the first signal component and a second portion 242 corresponding to the second signal component. Note that the first portion 243 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 242. Also note that the first portion 243 and second portion 242 might be formed with a first mirror portion 244 and second mirror portion 245, respectively. Note that a mirror portion may either be removed or may be kept for later processing. The exemplary communication system 200 may further comprise a RF transmission stage 250 adapted to transmit an RF signal. The RF transmission stage 250 may, for example and without limitation, share any or all characteristics with the RF transmission stage 150 discussed previously. Such an RF signal may, for example, be associated with the composite signal output from the signal combiner 230 and upconverted by the upconverter 240. The RF transmission stage 250 may, for example and without limitation, comprise a power amplifier 252, antenna 254 and other components generally associated with RF signal transmission.</p> <p><i>See, e.g., Rofougaran at 6:66-7:57.</i></p> <p>For example, the spectral placement module 510, optional second spectral placement module 520 and signal combiner 530 may operate in the analog domain. The first digital-to-analog converter 592 may convert the first baseband signal to the analog domain for processing by the spectral placement module 510. The second digital-to-analog converter 594 may convert the second baseband signal to the analog domain for processing by the second spectral placement module 520 or signal combiner 530. The signal combiner 530 then combines signals in the analog domain to generate an analog composite signal, which is then upconverted and transmitted by the upconverter 540 and RF transmission stage 550, respectively.</p>

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	<p><i>See, e.g.</i>, Rofougaran at 9:30-41.</p> <p>FIG. 7 is a diagram showing a portion of a seventh non-limiting exemplary communication system 700, in accordance with various aspects of the present invention. The exemplary communication system 700 may, for example and without limitation, share any or all characteristics with the exemplary systems 100-600 illustrated in FIGS. 1-6 and discussed previously.</p> <p>The exemplary communication system 700 may comprise a first mixer 744 that receives a spectrally shifted first baseband signal from the spectral placement module 710 and a first RF mixing signal (e.g., a 2.446 GHz signal generally associated with the Bluetooth communication protocol) from a first local oscillator 742. The exemplary communication system 700 may also comprise a second mixer 748 that receives a second baseband signal (or a spectrally shifted second baseband signal) and a second RF mixing signal (e.g., a 2.486 GHz signal generally associated with the IEEE 802.11(g) communication protocol) from a second local oscillator 746.</p> <p>The exemplary communication system 700 may comprise an RF signal combiner 730 that is adapted to combine input RF signals. The RF signal combiner 730 may, for example, receive and combine the output signals from the first mixer 744 and second mixer 748 to generate an RF composite signal. The exemplary communication system 700 may also comprise a RF transmission stage 750 that receives the RF composite signal from the RF signal combiner 730 and transmit the signal.</p> <p><i>See, e.g.</i>, Rofougaran at 10:18-43.</p> <p>The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 810 comprises receiving the first baseband signal, step 810 may comprise receiving the first baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The first baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 810 may, for example, comprise generating the first baseband signal independently (e.g.,</p>

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	<p>corresponding to an independent communication). Step 810 may alternatively, for example, comprise generating the first baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first baseband signal and other baseband signals for a single communication).</p> <p>The exemplary method 800 may, at step 820, comprise spectrally placing (or shifting) the first baseband signal (e.g., received at step 810). Step 820 may, for example and without limitation, share any or all functional characteristics with the spectral placement modules 110-710 of the exemplary systems 100-700 illustrated in FIGS. 1-7 and discussed previously.</p> <p>Step 820 may, for example, comprise spectrally shifting the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with a second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, step 820 may comprise implementing a frequency-hopping scheme with the first baseband signal. For example, in a scenario where there are one or more frequency bands (e.g., a second frequency space) associated with a second baseband signal, step 820 may comprise spectrally shifting the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p>In another non-limiting exemplary scenario, spectrally shifting the first baseband signal may result in the production of a spectral image (e.g., frequency content mirrored about a mixing frequency utilized to spectrally shift the first baseband signal). In such a scenario, step 820 may comprise accepting or rejecting the image.</p> <p>In a scenario where an image is rejected, step 820 may comprise rejecting the image in any of a variety of manners. For example and without limitation, step 820 may comprise performing image reject mixing to spectrally shift the first baseband signal. Such image reject mixing generally</p>

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	<p>comprises spectrally shifting a signal and rejecting an image associated with the spectrally shifted signal. Also for example, step 820 may comprise filtering out an unwanted image. The scope of various aspects of the present invention should not be limited by the utilization of image rejection or by any particular manner of performing such image rejection.</p> <p>The exemplary method 800 may, at step 830, comprise generating and/or receiving a second baseband signal corresponding to a second communication protocol (e.g., different from the first communication protocol). Step 830 may, for example and without limitation, share any or all functional characteristics with the second input 102 of the exemplary system 100 illustrated in FIG. 1 and discussed previously.</p> <p>The second baseband signal may, for example, correspond to a second communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 830 comprises receiving the second baseband signal, step 830 may comprise receiving the second baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 830 may, for example, comprise generating the second baseband signal independently (e.g., corresponding to a communication independent of a communication associated with the first baseband signal). Step 830 may alternatively, for example, comprise generating the second baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the second baseband signal and the first baseband signal for a single communication).</p> <p><i>See, e.g., Rofougaran at 11:53-13:4.</i></p> <p>Furthermore, this claim element is obvious in light of Rofougaran itself, when combined with any of the other references as charted for this claim element in Exs. A-1–A-31, First Supplemental Ex. A–Obviousness Chart, and/or when combined with the knowledge of one of ordinary skill in the art. Motivations to combine may come from the knowledge of the person of ordinary skill themselves, or from the known problems and predictable solutions as embodied in these references. Further</p>

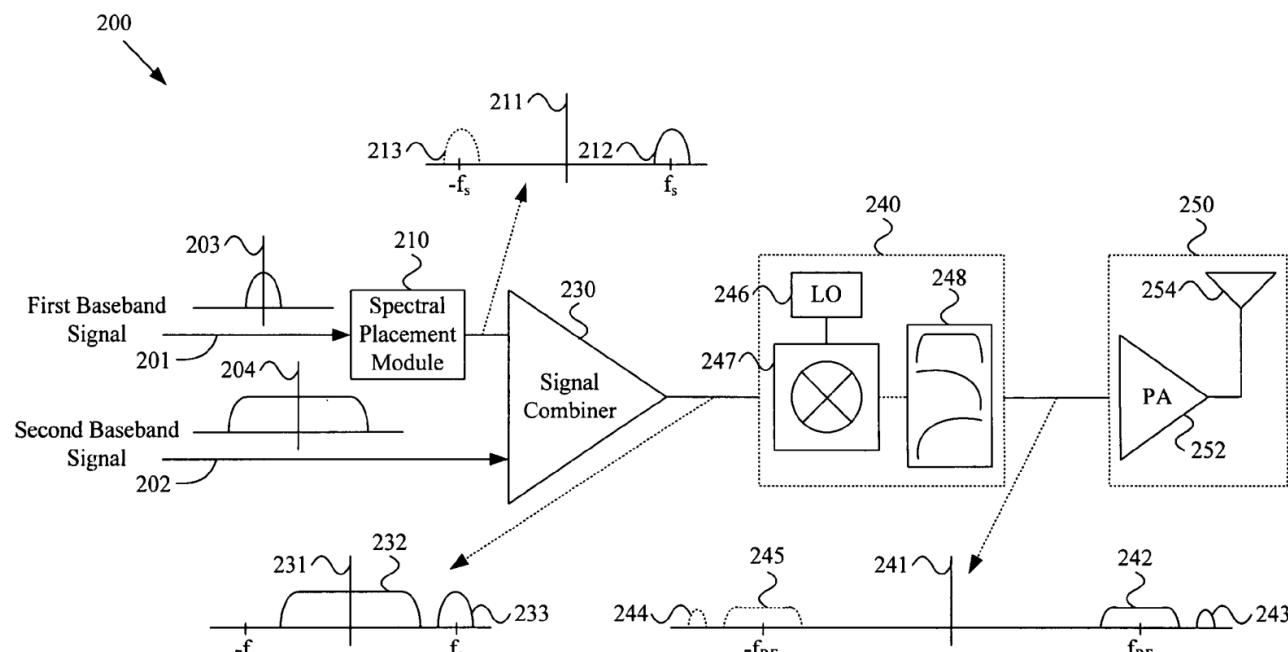
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	motivations to combine references and additional details may be found in the Cover Pleading and First Supplemental Ex. A-Obviousness Chart.
[14.3] receiving the transmitted signal on a second antenna;	Rofougaran discloses “receiving the transmitted signal on a second antenna.” See, e.g.: 

Figure 2

See, e.g., Rofougaran at Figure 2.

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	<p>The diagram illustrates a signal processing chain for RF transmission. It begins with two baseband signals: the 1st Baseband Signal and the 2nd Baseband Signal. These signals are processed by two DACs (Digital-to-Analog Converters), labeled 592 and 594. The outputs of the DACs are fed into a Spectral Placement Module (510) and an optional second spectral placement module (520). The outputs from the modules are combined at a Signal Combiner (530). The combined signal then passes through an Upconverter (540) and an RF Xmit Stage (550) before being transmitted.</p>

Figure 5

See, e.g., Rofougaran at Figure 5.

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	<p>The diagram illustrates a communication system architecture. A 'First Baseband Signal' enters a 'Spectral Placement Module' (710). A 'Second Baseband Signal' enters an 'Optional Second Spectral Placement Module' (720). Both modules output signals to mixers. The mixer for the first module receives a local oscillator signal from 'LO1' (e.g., 2.446 GHz) labeled 742. The mixer for the second module receives a local oscillator signal from 'LO2' (e.g., 2.486 GHz) labeled 746. The outputs of the mixers feed into an 'RF Signal Combiner' (730), which then connects to an 'RF Xmit Stage' (750) for transmission.</p> <p>Figure 7</p> <p>See, e.g., Rofougaran at Figure 7.</p> <p>FIG. 1 is a diagram showing a portion of a first non-limiting exemplary communication system 100, in accordance with various aspects of the present invention. The communication system (or device) may comprise characteristics of any of a variety of communication systems/devices (e.g., multimode wireless communication devices). For example and without limitation, the communication system may comprise characteristics of any of a variety of mobile wireless communication devices (e.g.,</p>

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	<p>cellular phones, paging devices, portable email devices, etc.). Also for example, the communication system may comprise characteristics of fixed communication systems or devices (e.g., network access points, base stations, satellites, wireless routers, set top boxes, etc.). Further for example, the communication system may comprise characteristics of a variety of electronic devices with wireless communication capability (e.g., televisions, music players, cameras, remote controls, personal digital assistants, handheld computers, gaming devices, etc.). Accordingly, the scope of various aspects of the present invention should not be limited by characteristics of particular communication systems or devices.</p> <p>The following discussion will, at times, refer to various communication modes. A multimode communication device may, for example, be adapted to communicate in a plurality of such communication modes. For the following discussion, a communication mode may generally be considered to coincide with communication utilizing a particular communication protocol or standard. A non-limiting list of exemplary communication protocols includes various cellular communication protocols (e.g., GSM, GPRS, EDGE, CDMA, WCDMA, TDMA, PDC, etc.), various wireless networking protocols or standards, including WLAN, WMAN, WPAN and WWAN (e.g., IEEE 802.11, Bluetooth, IEEE 802.15, UWB, IEEE 802.16, IEEE 802.20, Zigbee, any WiFi protocol, etc.), various television communication standards, etc. The scope of various aspects of the present invention should not be limited by characteristics of particular communication modes or protocols, whether standard or proprietary.</p> <p>The exemplary communication system 100 may comprise at least a first input 101 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to any of the previously mentioned communication protocols.</p> <p>The exemplary communication system 100 may also comprise at least a second input 102 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first</p>

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	<p>communication protocol discussed above). For example and without limitation, the second baseband signal may correspond to any of the previously mentioned communication protocols. The first baseband signal and the second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of the communication system 100. For example, such modules may generate the first and second baseband signals independently (e.g., corresponding to independent respective communications). Alternatively, for example, such modules may generate the first and second baseband signals in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first and second baseband signals for a single communication).</p> <p>The exemplary communication system 100 may additionally comprise a spectral placement module 110 that is adapted to spectrally shift the first baseband signal (i.e., shift the frequency spectrum of the first baseband signal). In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to spectrally shift the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with the second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to implement a frequency-hopping scheme with the first baseband signal. For example, in a scenario, where there are one or more frequency bands (e.g., a second frequency space) associated with the second baseband signal, the spectral placement module 110 may be adapted to shift the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p><i>See, e.g., Rofougaran at 2:38-3:58.</i></p> <p>The exemplary communication system 100 may also comprise a second spectral placement module 120. Such a second spectral placement module 120 may, for example, share any or all characteristics</p>

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	<p>with the spectral placement module 110 discussed previously. The incorporation of such a second spectral placement module 120 may, for example, provide spectral shifting flexibility. For example, in such an exemplary configuration, either or both of the first and second baseband signals may be spectrally shifted to substantially distinct frequency spaces. Also for example, in such an exemplary configuration, either or both of the first and second baseband signals may be frequency hopped. Note that though the second spectral placement module 120 is illustrated separate from the first spectral placement module 110, the second spectral placement module 120 may share any or all hardware and/or software components with the spectral placement module 110.</p> <p>The exemplary communication system 100 may further comprise a signal combiner 130 that is adapted to generate a composite signal comprising various input signals to the signal combiner 130. For example, the composite signal may simultaneously (i.e., at an instant in time) comprise components associated with various input signals. Note that such simultaneity need not always be present. For example, at a first instant in time, the signal output from the signal combiner 130 might comprise a plurality of components associated with a plurality of respective input signals, at a second instant in time, the signal output from the signal combiner 130 might comprise a single component associated with a single respective input signal, and at a third instant in time, the signal output from the signal combiner 130 might comprise no components.</p> <p>In a first non-limiting exemplary scenario, the signal combiner 130 may receive a first signal that is based on the first baseband signal (e.g., associated with a first communication protocol). Also, the signal combiner 130 may receive a second signal that is based on the second baseband signal (e.g., associated with a second communication protocol). In such a scenario, the signal combiner 130 may combine the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the first baseband signal and a second signal component based on the second baseband signal. In such a scenario, for example where the frequency spectra of the first and second baseband signals do not overlap, the first and second baseband signals might not be spectrally shifted prior to combining by the signal combiner 130. In such a scenario, the spectral placement module 110 (and optionally, the second spectral placement module 120) may receive a control signal indicating whether or not to perform spectral shifting and/or to what degree spectral shifting should be implemented.</p>

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	<p><i>See, e.g.</i>, Rofougaran at 4:16-67.</p> <p>Various components of the exemplary communication system 100 (and other communication systems illustrated and discussed herein) may be implemented in analog and/or digital circuitry. To illustrate this, the exemplary communication system 100 is not shown with analog-to-digital converters (ADCs) or digital-to-analog converters (DACs). FIGS. 4-6, to be discussed later, show various non-limiting exemplary configurations including such converters.</p> <p>FIG. 2 is a diagram showing a portion of a second non-limiting exemplary communication system 200, in accordance with various aspects of the present invention. The communication system 200 may, for example and without limitation, share any or all characteristics with the communication system 100 illustrated in FIG. 1 and discussed previously.</p> <p>The exemplary communication system 200 may comprise at least a first input 201 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to the Bluetooth communication protocol. FIG. 2 shows an exemplary frequency spectrum 203 associated with the first baseband signal.</p> <p>The exemplary communication system 200 may also comprise at least a second input 202 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first communication protocol discussed above). For example and without limitation, the first baseband signal may correspond to an IEEE 802.11 communication protocol (e.g., IEEE 802.11(b) or IEEE 802.11(g)). FIG. 2 shows an exemplary frequency spectrum 204 associated with the second baseband signal.</p> <p><i>See, e.g.</i>, Rofougaran at 5:64-6:31.</p>

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	<p>In a non-limiting exemplary configuration illustrated in FIG. 2, the signal combiner 230 receives a first signal from the spectral placement module 210 that is based on the spectrally shifted first baseband signal. Also, the signal combiner 230 receives a second signal that is based on the second baseband signal. In such a configuration, the signal combiner 230 combines the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the spectrally shifted first baseband signal and a second signal component based on the second baseband signal (e.g., not spectrally shifted).</p> <p>FIG. 2 shows an exemplary frequency spectrum 231 associated with the composite signal formed by the signal combiner 230. The spectrum 231 comprises a first portion 233 corresponding to the first signal component, and a second portion 232 corresponding to the second signal component. Note that the first portion 233 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 232.</p> <p>The exemplary communication system 200 may also comprise an upconverter 240 adapted to upconvert a signal (e.g., the composite signal from the signal combiner 230) for transmission. The upconverter 240 may, for example and without limitation, share any or all characteristics with the upconverter 140 discussed previously.</p> <p>The upconverter 240 may, for example, comprise a mixer 247, a local oscillator 246 and one or more filters 248. The mixer 247 may, for example, receive the composite signal from the signal combiner 230 and an RF mixing signal at frequency fRF from a local oscillator 246. The upconverter 240 may, for example, filter the upconverted signal from the mixer 247 with one or more filters 248. The output of the upconverter 240 may, for example, comprise a signal indicative of the composite signal spectrally shifted to an RF frequency.</p> <p>FIG. 2 shows an exemplary frequency spectrum 241 associated with the RF signal formed by the upconverter 240. The frequency spectrum 241 comprises a first portion 243 corresponding to the first signal component and a second portion 242 corresponding to the second signal component. Note that the first portion 243 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 242. Also note that the first portion 243 and</p>

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	<p>second portion 242 might be formed with a first mirror portion 244 and second mirror portion 245, respectively. Note that a mirror portion may either be removed or may be kept for later processing. The exemplary communication system 200 may further comprise a RF transmission stage 250 adapted to transmit an RF signal. The RF transmission stage 250 may, for example and without limitation, share any or all characteristics with the RF transmission stage 150 discussed previously. Such an RF signal may, for example, be associated with the composite signal output from the signal combiner 230 and upconverted by the upconverter 240. The RF transmission stage 250 may, for example and without limitation, comprise a power amplifier 252, antenna 254 and other components generally associated with RF signal transmission.</p> <p><i>See, e.g., Rofougaran at 6:66-7:57.</i></p> <p>For example, the spectral placement module 510, optional second spectral placement module 520 and signal combiner 530 may operate in the analog domain. The first digital-to-analog converter 592 may convert the first baseband signal to the analog domain for processing by the spectral placement module 510. The second digital-to-analog converter 594 may convert the second baseband signal to the analog domain for processing by the second spectral placement module 520 or signal combiner 530. The signal combiner 530 then combines signals in the analog domain to generate an analog composite signal, which is then upconverted and transmitted by the upconverter 540 and RF transmission stage 550, respectively.</p> <p><i>See, e.g., Rofougaran at 9:30-41.</i></p> <p>FIG. 7 is a diagram showing a portion of a seventh non-limiting exemplary communication system 700, in accordance with various aspects of the present invention. The exemplary communication system 700 may, for example and without limitation, share any or all characteristics with the exemplary systems 100-600 illustrated in FIGS. 1-6 and discussed previously.</p> <p>The exemplary communication system 700 may comprise a first mixer 744 that receives a spectrally shifted first baseband signal from the spectral placement module 710 and a first RF mixing signal (e.g., a 2.446 GHz signal generally associated with the Bluetooth communication protocol) from a</p>

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	<p>first local oscillator 742. The exemplary communication system 700 may also comprise a second mixer 748 that receives a second baseband signal (or a spectrally shifted second baseband signal) and a second RF mixing signal (e.g., a 2.486 GHz signal generally associated with the IEEE 802.11(g) communication protocol) from a second local oscillator 746.</p> <p>The exemplary communication system 700 may comprise an RF signal combiner 730 that is adapted to combine input RF signals. The RF signal combiner 730 may, for example, receive and combine the output signals from the first mixer 744 and second mixer 748 to generate an RF composite signal. The exemplary communication system 700 may also comprise a RF transmission stage 750 that receives the RF composite signal from the RF signal combiner 730 and transmit the signal.</p> <p><i>See, e.g., Rofougaran at 10:18-43.</i></p> <p>The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 810 comprises receiving the first baseband signal, step 810 may comprise receiving the first baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The first baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 810 may, for example, comprise generating the first baseband signal independently (e.g., corresponding to an independent communication). Step 810 may alternatively, for example, comprise generating the first baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first baseband signal and other baseband signals for a single communication).</p> <p>The exemplary method 800 may, at step 820, comprise spectrally placing (or shifting) the first baseband signal (e.g., received at step 810). Step 820 may, for example and without limitation, share any or all functional characteristics with the spectral placement modules 110-710 of the exemplary systems 100-700 illustrated in FIGS. 1-7 and discussed previously.</p>

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	<p>Step 820 may, for example, comprise spectrally shifting the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with a second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, step 820 may comprise implementing a frequency-hopping scheme with the first baseband signal. For example, in a scenario where there are one or more frequency bands (e.g., a second frequency space) associated with a second baseband signal, step 820 may comprise spectrally shifting the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p>In another non-limiting exemplary scenario, spectrally shifting the first baseband signal may result in the production of a spectral image (e.g., frequency content mirrored about a mixing frequency utilized to spectrally shift the first baseband signal). In such a scenario, step 820 may comprise accepting or rejecting the image.</p> <p>In a scenario where an image is rejected, step 820 may comprise rejecting the image in any of a variety of manners. For example and without limitation, step 820 may comprise performing image reject mixing to spectrally shift the first baseband signal. Such image reject mixing generally comprises spectrally shifting a signal and rejecting an image associated with the spectrally shifted signal. Also for example, step 820 may comprise filtering out an unwanted image. The scope of various aspects of the present invention should not be limited by the utilization of image rejection or by any particular manner of performing such image rejection.</p> <p>The exemplary method 800 may, at step 830, comprise generating and/or receiving a second baseband signal corresponding to a second communication protocol (e.g., different from the first communication protocol). Step 830 may, for example and without limitation, share any or all functional characteristics with the second input 102 of the exemplary system 100 illustrated in FIG. 1 and discussed previously.</p>

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	<p>The second baseband signal may, for example, correspond to a second communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 830 comprises receiving the second baseband signal, step 830 may comprise receiving the second baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 830 may, for example, comprise generating the second baseband signal independently (e.g., corresponding to a communication independent of a communication associated with the first baseband signal). Step 830 may alternatively, for example, comprise generating the second baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the second baseband signal and the first baseband signal for a single communication).</p> <p><i>See, e.g., Rofougaran at 11:53-13:4.</i></p> <p>Furthermore, this claim element is obvious in light of Rofougaran itself, when combined with any of the other references as charted for this claim element in Exs. A-1–A-31, First Supplemental Ex. A-Obviousness Chart, and/or when combined with the knowledge of one of ordinary skill in the art. Motivations to combine may come from the knowledge of the person of ordinary skill themselves, or from the known problems and predictable solutions as embodied in these references. Further motivations to combine references and additional details may be found in the Cover Pleading and First Supplemental Ex. A-Obviousness Chart.</p>
[14.4] amplifying the received signal in a low noise amplifier resulting in an amplified received up-converted signal, wherein the bandwidth of said low noise amplifier is greater than the difference between the lowest frequency in the	Rofougaran discloses “amplifying the received signal in a low noise amplifier resulting in an amplified received up-converted signal, wherein the bandwidth of said low noise amplifier is greater than the difference between the lowest frequency in the first up-converted frequency range and the highest frequency in the second up-converted frequency range.” See, e.g.:

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<p>first up-converted frequency range and the highest frequency in the second up-converted frequency range;</p>	<p>The diagram illustrates a signal processing system for spectral placement. It starts with two baseband signals: a First Baseband Signal (201) and a Second Baseband Signal (202). These signals are processed by a Spectral Placement Module (210), which generates three intermediate signals: 211, 212, and 213. Signals 211 and 212 are positioned at frequencies f_s above the sampling frequency f_s. Signal 213 is positioned at a frequency $-f_s$ below f_s. These three signals are combined at a Signal Combiner (230). The combined signal is then processed by a mixer (247), which includes a Local Oscillator (LO) (246) and a混频器 (248). The output of the mixer is fed into a Power Amplifier (PA) (250), which also receives a signal from a low-noise amplifier (LNA) (254). The final output signal (252) is transmitted at a frequency f_{RF}.</p> <p>Figure 2</p> <p>See, e.g., Rofougaran at Figure 2.</p>

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	<p>The diagram illustrates a signal processing system for two baseband signals. On the left, two baseband signals enter the system: the ^{1st} Baseband Signal enters a DAC labeled 592, and the 2nd Baseband Signal enters a DAC labeled 594. The outputs of these DACs feed into a Spectral Placement Module labeled 510. The output of the Spectral Placement Module 510 then enters a Signal Combiner labeled 530. The Signal Combiner 530 also receives input from an optional second module, the Optional Second Spectral Placement Module labeled 520. The output of the Signal Combiner 530 is fed into an Upconverter labeled 540, which then connects to an RF Xmit Stage labeled 550. An arrow labeled 500 points to the top of the first DAC 592.</p>

Figure 5

See, e.g., Rofougaran at Figure 5.

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	<p>Figure 7</p> <p>See, e.g., Rofougaran at Figure 7.</p> <p>FIG. 1 is a diagram showing a portion of a first non-limiting exemplary communication system 100, in accordance with various aspects of the present invention. The communication system (or device) may comprise characteristics of any of a variety of communication systems/devices (e.g., multimode wireless communication devices). For example and without limitation, the communication system may comprise characteristics of any of a variety of mobile wireless communication devices (e.g.,</p>

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	<p>cellular phones, paging devices, portable email devices, etc.). Also for example, the communication system may comprise characteristics of fixed communication systems or devices (e.g., network access points, base stations, satellites, wireless routers, set top boxes, etc.). Further for example, the communication system may comprise characteristics of a variety of electronic devices with wireless communication capability (e.g., televisions, music players, cameras, remote controls, personal digital assistants, handheld computers, gaming devices, etc.). Accordingly, the scope of various aspects of the present invention should not be limited by characteristics of particular communication systems or devices.</p> <p>The following discussion will, at times, refer to various communication modes. A multimode communication device may, for example, be adapted to communicate in a plurality of such communication modes. For the following discussion, a communication mode may generally be considered to coincide with communication utilizing a particular communication protocol or standard. A non-limiting list of exemplary communication protocols includes various cellular communication protocols (e.g., GSM, GPRS, EDGE, CDMA, WCDMA, TDMA, PDC, etc.), various wireless networking protocols or standards, including WLAN, WMAN, WPAN and WWAN (e.g., IEEE 802.11, Bluetooth, IEEE 802.15, UWB, IEEE 802.16, IEEE 802.20, Zigbee, any WiFi protocol, etc.), various television communication standards, etc. The scope of various aspects of the present invention should not be limited by characteristics of particular communication modes or protocols, whether standard or proprietary.</p> <p>The exemplary communication system 100 may comprise at least a first input 101 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to any of the previously mentioned communication protocols.</p> <p>The exemplary communication system 100 may also comprise at least a second input 102 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first</p>

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	<p>communication protocol discussed above). For example and without limitation, the second baseband signal may correspond to any of the previously mentioned communication protocols. The first baseband signal and the second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of the communication system 100. For example, such modules may generate the first and second baseband signals independently (e.g., corresponding to independent respective communications). Alternatively, for example, such modules may generate the first and second baseband signals in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first and second baseband signals for a single communication).</p> <p>The exemplary communication system 100 may additionally comprise a spectral placement module 110 that is adapted to spectrally shift the first baseband signal (i.e., shift the frequency spectrum of the first baseband signal). In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to spectrally shift the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with the second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to implement a frequency-hopping scheme with the first baseband signal. For example, in a scenario, where there are one or more frequency bands (e.g., a second frequency space) associated with the second baseband signal, the spectral placement module 110 may be adapted to shift the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p><i>See, e.g., Rofougaran at 2:38-3:58.</i></p> <p>The exemplary communication system 100 may also comprise a second spectral placement module 120. Such a second spectral placement module 120 may, for example, share any or all characteristics</p>

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	<p>with the spectral placement module 110 discussed previously. The incorporation of such a second spectral placement module 120 may, for example, provide spectral shifting flexibility. For example, in such an exemplary configuration, either or both of the first and second baseband signals may be spectrally shifted to substantially distinct frequency spaces. Also for example, in such an exemplary configuration, either or both of the first and second baseband signals may be frequency hopped. Note that though the second spectral placement module 120 is illustrated separate from the first spectral placement module 110, the second spectral placement module 120 may share any or all hardware and/or software components with the spectral placement module 110.</p> <p>The exemplary communication system 100 may further comprise a signal combiner 130 that is adapted to generate a composite signal comprising various input signals to the signal combiner 130. For example, the composite signal may simultaneously (i.e., at an instant in time) comprise components associated with various input signals. Note that such simultaneity need not always be present. For example, at a first instant in time, the signal output from the signal combiner 130 might comprise a plurality of components associated with a plurality of respective input signals, at a second instant in time, the signal output from the signal combiner 130 might comprise a single component associated with a single respective input signal, and at a third instant in time, the signal output from the signal combiner 130 might comprise no components.</p> <p>In a first non-limiting exemplary scenario, the signal combiner 130 may receive a first signal that is based on the first baseband signal (e.g., associated with a first communication protocol). Also, the signal combiner 130 may receive a second signal that is based on the second baseband signal (e.g., associated with a second communication protocol). In such a scenario, the signal combiner 130 may combine the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the first baseband signal and a second signal component based on the second baseband signal. In such a scenario, for example where the frequency spectra of the first and second baseband signals do not overlap, the first and second baseband signals might not be spectrally shifted prior to combining by the signal combiner 130. In such a scenario, the spectral placement module 110 (and optionally, the second spectral placement module 120) may receive a control signal indicating whether or not to perform spectral shifting and/or to what degree spectral shifting should be implemented.</p>

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	<p><i>See, e.g.</i>, Rofougaran at 4:16-67.</p> <p>Various components of the exemplary communication system 100 (and other communication systems illustrated and discussed herein) may be implemented in analog and/or digital circuitry. To illustrate this, the exemplary communication system 100 is not shown with analog-to-digital converters (ADCs) or digital-to-analog converters (DACs). FIGS. 4-6, to be discussed later, show various non-limiting exemplary configurations including such converters.</p> <p>FIG. 2 is a diagram showing a portion of a second non-limiting exemplary communication system 200, in accordance with various aspects of the present invention. The communication system 200 may, for example and without limitation, share any or all characteristics with the communication system 100 illustrated in FIG. 1 and discussed previously.</p> <p>The exemplary communication system 200 may comprise at least a first input 201 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to the Bluetooth communication protocol. FIG. 2 shows an exemplary frequency spectrum 203 associated with the first baseband signal.</p> <p>The exemplary communication system 200 may also comprise at least a second input 202 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first communication protocol discussed above). For example and without limitation, the first baseband signal may correspond to an IEEE 802.11 communication protocol (e.g., IEEE 802.11(b) or IEEE 802.11(g)). FIG. 2 shows an exemplary frequency spectrum 204 associated with the second baseband signal.</p> <p><i>See, e.g.</i>, Rofougaran at 5:64-6:31.</p>

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	<p>In a non-limiting exemplary configuration illustrated in FIG. 2, the signal combiner 230 receives a first signal from the spectral placement module 210 that is based on the spectrally shifted first baseband signal. Also, the signal combiner 230 receives a second signal that is based on the second baseband signal. In such a configuration, the signal combiner 230 combines the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the spectrally shifted first baseband signal and a second signal component based on the second baseband signal (e.g., not spectrally shifted).</p> <p>FIG. 2 shows an exemplary frequency spectrum 231 associated with the composite signal formed by the signal combiner 230. The spectrum 231 comprises a first portion 233 corresponding to the first signal component, and a second portion 232 corresponding to the second signal component. Note that the first portion 233 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 232.</p> <p>The exemplary communication system 200 may also comprise an upconverter 240 adapted to upconvert a signal (e.g., the composite signal from the signal combiner 230) for transmission. The upconverter 240 may, for example and without limitation, share any or all characteristics with the upconverter 140 discussed previously.</p> <p>The upconverter 240 may, for example, comprise a mixer 247, a local oscillator 246 and one or more filters 248. The mixer 247 may, for example, receive the composite signal from the signal combiner 230 and an RF mixing signal at frequency fRF from a local oscillator 246. The upconverter 240 may, for example, filter the upconverted signal from the mixer 247 with one or more filters 248. The output of the upconverter 240 may, for example, comprise a signal indicative of the composite signal spectrally shifted to an RF frequency.</p> <p>FIG. 2 shows an exemplary frequency spectrum 241 associated with the RF signal formed by the upconverter 240. The frequency spectrum 241 comprises a first portion 243 corresponding to the first signal component and a second portion 242 corresponding to the second signal component. Note that the first portion 243 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 242. Also note that the first portion 243 and</p>

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	<p>second portion 242 might be formed with a first mirror portion 244 and second mirror portion 245, respectively. Note that a mirror portion may either be removed or may be kept for later processing. The exemplary communication system 200 may further comprise a RF transmission stage 250 adapted to transmit an RF signal. The RF transmission stage 250 may, for example and without limitation, share any or all characteristics with the RF transmission stage 150 discussed previously. Such an RF signal may, for example, be associated with the composite signal output from the signal combiner 230 and upconverted by the upconverter 240. The RF transmission stage 250 may, for example and without limitation, comprise a power amplifier 252, antenna 254 and other components generally associated with RF signal transmission.</p> <p><i>See, e.g., Rofougaran at 6:66-7:57.</i></p> <p>For example, the spectral placement module 510, optional second spectral placement module 520 and signal combiner 530 may operate in the analog domain. The first digital-to-analog converter 592 may convert the first baseband signal to the analog domain for processing by the spectral placement module 510. The second digital-to-analog converter 594 may convert the second baseband signal to the analog domain for processing by the second spectral placement module 520 or signal combiner 530. The signal combiner 530 then combines signals in the analog domain to generate an analog composite signal, which is then upconverted and transmitted by the upconverter 540 and RF transmission stage 550, respectively.</p> <p><i>See, e.g., Rofougaran at 9:30-41.</i></p> <p>FIG. 7 is a diagram showing a portion of a seventh non-limiting exemplary communication system 700, in accordance with various aspects of the present invention. The exemplary communication system 700 may, for example and without limitation, share any or all characteristics with the exemplary systems 100-600 illustrated in FIGS. 1-6 and discussed previously.</p> <p>The exemplary communication system 700 may comprise a first mixer 744 that receives a spectrally shifted first baseband signal from the spectral placement module 710 and a first RF mixing signal (e.g., a 2.446 GHz signal generally associated with the Bluetooth communication protocol) from a</p>

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	<p>first local oscillator 742. The exemplary communication system 700 may also comprise a second mixer 748 that receives a second baseband signal (or a spectrally shifted second baseband signal) and a second RF mixing signal (e.g., a 2.486 GHz signal generally associated with the IEEE 802.11(g) communication protocol) from a second local oscillator 746.</p> <p>The exemplary communication system 700 may comprise an RF signal combiner 730 that is adapted to combine input RF signals. The RF signal combiner 730 may, for example, receive and combine the output signals from the first mixer 744 and second mixer 748 to generate an RF composite signal. The exemplary communication system 700 may also comprise a RF transmission stage 750 that receives the RF composite signal from the RF signal combiner 730 and transmit the signal.</p> <p><i>See, e.g., Rofougaran at 10:18-43.</i></p> <p>The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 810 comprises receiving the first baseband signal, step 810 may comprise receiving the first baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The first baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 810 may, for example, comprise generating the first baseband signal independently (e.g., corresponding to an independent communication). Step 810 may alternatively, for example, comprise generating the first baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first baseband signal and other baseband signals for a single communication).</p> <p>The exemplary method 800 may, at step 820, comprise spectrally placing (or shifting) the first baseband signal (e.g., received at step 810). Step 820 may, for example and without limitation, share any or all functional characteristics with the spectral placement modules 110-710 of the exemplary systems 100-700 illustrated in FIGS. 1-7 and discussed previously.</p>

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	<p>Step 820 may, for example, comprise spectrally shifting the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with a second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, step 820 may comprise implementing a frequency-hopping scheme with the first baseband signal. For example, in a scenario where there are one or more frequency bands (e.g., a second frequency space) associated with a second baseband signal, step 820 may comprise spectrally shifting the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p>In another non-limiting exemplary scenario, spectrally shifting the first baseband signal may result in the production of a spectral image (e.g., frequency content mirrored about a mixing frequency utilized to spectrally shift the first baseband signal). In such a scenario, step 820 may comprise accepting or rejecting the image.</p> <p>In a scenario where an image is rejected, step 820 may comprise rejecting the image in any of a variety of manners. For example and without limitation, step 820 may comprise performing image reject mixing to spectrally shift the first baseband signal. Such image reject mixing generally comprises spectrally shifting a signal and rejecting an image associated with the spectrally shifted signal. Also for example, step 820 may comprise filtering out an unwanted image. The scope of various aspects of the present invention should not be limited by the utilization of image rejection or by any particular manner of performing such image rejection.</p> <p>The exemplary method 800 may, at step 830, comprise generating and/or receiving a second baseband signal corresponding to a second communication protocol (e.g., different from the first communication protocol). Step 830 may, for example and without limitation, share any or all functional characteristics with the second input 102 of the exemplary system 100 illustrated in FIG. 1 and discussed previously.</p>

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	<p>The second baseband signal may, for example, correspond to a second communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 830 comprises receiving the second baseband signal, step 830 may comprise receiving the second baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 830 may, for example, comprise generating the second baseband signal independently (e.g., corresponding to a communication independent of a communication associated with the first baseband signal). Step 830 may alternatively, for example, comprise generating the second baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the second baseband signal and the first baseband signal for a single communication).</p> <p><i>See, e.g., Rofougaran at 11:53-13:4.</i></p> <p>Furthermore, this claim element is obvious in light of Rofougaran itself, when combined with any of the other references as charted for this claim element in Exs. A-1–A-31, First Supplemental Ex. A-Obviousness Chart, and/or when combined with the knowledge of one of ordinary skill in the art. Motivations to combine may come from the knowledge of the person of ordinary skill themselves, or from the known problems and predictable solutions as embodied in these references. Further motivations to combine references and additional details may be found in the Cover Pleading and First Supplemental Ex. A-Obviousness Chart.</p>
[14.5] down-converting the amplified received up-converted signal using a first down-converter and a signal corresponding to the first RF center frequency to produce a fourth analog signal	Rofougaran discloses “down-converting the amplified received up-converted signal using a first down-converter and a signal corresponding to the first RF center frequency to produce a fourth analog signal corresponding to the first analog signal.” See, e.g.:

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<p>corresponding to the first analog signal; and</p>	<p>The diagram illustrates a signal processing system for spectral placement. It starts with two baseband signals: 'First Baseband Signal' (201) and 'Second Baseband Signal' (202), which are fed into a 'Spectral Placement Module' (210). This module outputs signals 211 and 212, which are positioned at frequencies $-f_s$ and f_s relative to a sampling frequency f_s. These signals are then combined by a 'Signal Combiner' (230). The combined signal 247 is fed into a mixer (246) along with a 'Local Oscillator' (LO) signal 246. The mixer also includes a switch (248) and a low-pass filter (249). The output of the mixer 247 is then passed through a power amplifier (PA) 250, represented by a triangle, and transmitted via an antenna 252. The entire process is shown against a background of frequency axes: the top axis shows the placement of signals 211 and 212 around f_s, and the bottom axis shows the resulting RF spectrum 241 centered at f_{RF}, with components 244 and 245 on either side.</p>

Figure 2

See, e.g., Rofougaran at Figure 2.

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	<p>Figure 5</p> <p><i>See, e.g., Rofougaran at Figure 5.</i></p>

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	<p>The diagram illustrates a communication system architecture. It starts with two baseband signal inputs: a "First Baseband Signal" and a "Second Baseband Signal". The First Baseband Signal is processed by a "Spectral Placement Module" (710). This module is connected to a mixer (744), which also receives a local oscillator signal from "LO1" (e.g., 2.446 GHz). The output of the mixer is then sent to an "RF Signal Combiner" (730). The Second Baseband Signal is processed by an "Optional Second Spectral Placement Module" (720). This module is connected to another mixer (748), which receives a local oscillator signal from "LO2" (e.g., 2.486 GHz). The output of this second mixer is also sent to the "RF Signal Combiner" (730). Finally, the combined signal from the "RF Signal Combiner" passes through an "RF Xmit Stage" (750) for transmission.</p>

Figure 7

See, e.g., Rofougaran at Figure 7.

FIG. 1 is a diagram showing a portion of a first non-limiting exemplary communication system 100, in accordance with various aspects of the present invention. The communication system (or device) may comprise characteristics of any of a variety of communication systems/devices (e.g., multimode wireless communication devices). For example and without limitation, the communication system may comprise characteristics of any of a variety of mobile wireless communication devices (e.g.,

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	<p>cellular phones, paging devices, portable email devices, etc.). Also for example, the communication system may comprise characteristics of fixed communication systems or devices (e.g., network access points, base stations, satellites, wireless routers, set top boxes, etc.). Further for example, the communication system may comprise characteristics of a variety of electronic devices with wireless communication capability (e.g., televisions, music players, cameras, remote controls, personal digital assistants, handheld computers, gaming devices, etc.). Accordingly, the scope of various aspects of the present invention should not be limited by characteristics of particular communication systems or devices.</p> <p>The following discussion will, at times, refer to various communication modes. A multimode communication device may, for example, be adapted to communicate in a plurality of such communication modes. For the following discussion, a communication mode may generally be considered to coincide with communication utilizing a particular communication protocol or standard. A non-limiting list of exemplary communication protocols includes various cellular communication protocols (e.g., GSM, GPRS, EDGE, CDMA, WCDMA, TDMA, PDC, etc.), various wireless networking protocols or standards, including WLAN, WMAN, WPAN and WWAN (e.g., IEEE 802.11, Bluetooth, IEEE 802.15, UWB, IEEE 802.16, IEEE 802.20, Zigbee, any WiFi protocol, etc.), various television communication standards, etc. The scope of various aspects of the present invention should not be limited by characteristics of particular communication modes or protocols, whether standard or proprietary.</p> <p>The exemplary communication system 100 may comprise at least a first input 101 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to any of the previously mentioned communication protocols.</p> <p>The exemplary communication system 100 may also comprise at least a second input 102 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first</p>

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	<p>communication protocol discussed above). For example and without limitation, the second baseband signal may correspond to any of the previously mentioned communication protocols. The first baseband signal and the second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of the communication system 100. For example, such modules may generate the first and second baseband signals independently (e.g., corresponding to independent respective communications). Alternatively, for example, such modules may generate the first and second baseband signals in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first and second baseband signals for a single communication).</p> <p>The exemplary communication system 100 may additionally comprise a spectral placement module 110 that is adapted to spectrally shift the first baseband signal (i.e., shift the frequency spectrum of the first baseband signal). In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to spectrally shift the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with the second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to implement a frequency-hopping scheme with the first baseband signal. For example, in a scenario, where there are one or more frequency bands (e.g., a second frequency space) associated with the second baseband signal, the spectral placement module 110 may be adapted to shift the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p><i>See, e.g., Rofougaran at 2:38-3:58.</i></p> <p>The exemplary communication system 100 may also comprise a second spectral placement module 120. Such a second spectral placement module 120 may, for example, share any or all characteristics</p>

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	<p>with the spectral placement module 110 discussed previously. The incorporation of such a second spectral placement module 120 may, for example, provide spectral shifting flexibility. For example, in such an exemplary configuration, either or both of the first and second baseband signals may be spectrally shifted to substantially distinct frequency spaces. Also for example, in such an exemplary configuration, either or both of the first and second baseband signals may be frequency hopped. Note that though the second spectral placement module 120 is illustrated separate from the first spectral placement module 110, the second spectral placement module 120 may share any or all hardware and/or software components with the spectral placement module 110.</p> <p>The exemplary communication system 100 may further comprise a signal combiner 130 that is adapted to generate a composite signal comprising various input signals to the signal combiner 130. For example, the composite signal may simultaneously (i.e., at an instant in time) comprise components associated with various input signals. Note that such simultaneity need not always be present. For example, at a first instant in time, the signal output from the signal combiner 130 might comprise a plurality of components associated with a plurality of respective input signals, at a second instant in time, the signal output from the signal combiner 130 might comprise a single component associated with a single respective input signal, and at a third instant in time, the signal output from the signal combiner 130 might comprise no components.</p> <p>In a first non-limiting exemplary scenario, the signal combiner 130 may receive a first signal that is based on the first baseband signal (e.g., associated with a first communication protocol). Also, the signal combiner 130 may receive a second signal that is based on the second baseband signal (e.g., associated with a second communication protocol). In such a scenario, the signal combiner 130 may combine the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the first baseband signal and a second signal component based on the second baseband signal. In such a scenario, for example where the frequency spectra of the first and second baseband signals do not overlap, the first and second baseband signals might not be spectrally shifted prior to combining by the signal combiner 130. In such a scenario, the spectral placement module 110 (and optionally, the second spectral placement module 120) may receive a control signal indicating whether or not to perform spectral shifting and/or to what degree spectral shifting should be implemented.</p>

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	<p><i>See, e.g.</i>, Rofougaran at 4:16-67.</p> <p>Various components of the exemplary communication system 100 (and other communication systems illustrated and discussed herein) may be implemented in analog and/or digital circuitry. To illustrate this, the exemplary communication system 100 is not shown with analog-to-digital converters (ADCs) or digital-to-analog converters (DACs). FIGS. 4-6, to be discussed later, show various non-limiting exemplary configurations including such converters.</p> <p>FIG. 2 is a diagram showing a portion of a second non-limiting exemplary communication system 200, in accordance with various aspects of the present invention. The communication system 200 may, for example and without limitation, share any or all characteristics with the communication system 100 illustrated in FIG. 1 and discussed previously.</p> <p>The exemplary communication system 200 may comprise at least a first input 201 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to the Bluetooth communication protocol. FIG. 2 shows an exemplary frequency spectrum 203 associated with the first baseband signal.</p> <p>The exemplary communication system 200 may also comprise at least a second input 202 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first communication protocol discussed above). For example and without limitation, the first baseband signal may correspond to an IEEE 802.11 communication protocol (e.g., IEEE 802.11(b) or IEEE 802.11(g)). FIG. 2 shows an exemplary frequency spectrum 204 associated with the second baseband signal.</p> <p><i>See, e.g.</i>, Rofougaran at 5:64-6:31.</p>

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	<p>In a non-limiting exemplary configuration illustrated in FIG. 2, the signal combiner 230 receives a first signal from the spectral placement module 210 that is based on the spectrally shifted first baseband signal. Also, the signal combiner 230 receives a second signal that is based on the second baseband signal. In such a configuration, the signal combiner 230 combines the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the spectrally shifted first baseband signal and a second signal component based on the second baseband signal (e.g., not spectrally shifted).</p> <p>FIG. 2 shows an exemplary frequency spectrum 231 associated with the composite signal formed by the signal combiner 230. The spectrum 231 comprises a first portion 233 corresponding to the first signal component, and a second portion 232 corresponding to the second signal component. Note that the first portion 233 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 232.</p> <p>The exemplary communication system 200 may also comprise an upconverter 240 adapted to upconvert a signal (e.g., the composite signal from the signal combiner 230) for transmission. The upconverter 240 may, for example and without limitation, share any or all characteristics with the upconverter 140 discussed previously.</p> <p>The upconverter 240 may, for example, comprise a mixer 247, a local oscillator 246 and one or more filters 248. The mixer 247 may, for example, receive the composite signal from the signal combiner 230 and an RF mixing signal at frequency fRF from a local oscillator 246. The upconverter 240 may, for example, filter the upconverted signal from the mixer 247 with one or more filters 248. The output of the upconverter 240 may, for example, comprise a signal indicative of the composite signal spectrally shifted to an RF frequency.</p> <p>FIG. 2 shows an exemplary frequency spectrum 241 associated with the RF signal formed by the upconverter 240. The frequency spectrum 241 comprises a first portion 243 corresponding to the first signal component and a second portion 242 corresponding to the second signal component. Note that the first portion 243 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 242. Also note that the first portion 243 and</p>

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	<p>second portion 242 might be formed with a first mirror portion 244 and second mirror portion 245, respectively. Note that a mirror portion may either be removed or may be kept for later processing. The exemplary communication system 200 may further comprise a RF transmission stage 250 adapted to transmit an RF signal. The RF transmission stage 250 may, for example and without limitation, share any or all characteristics with the RF transmission stage 150 discussed previously. Such an RF signal may, for example, be associated with the composite signal output from the signal combiner 230 and upconverted by the upconverter 240. The RF transmission stage 250 may, for example and without limitation, comprise a power amplifier 252, antenna 254 and other components generally associated with RF signal transmission.</p> <p><i>See, e.g., Rofougaran at 6:66-7:57.</i></p> <p>For example, the spectral placement module 510, optional second spectral placement module 520 and signal combiner 530 may operate in the analog domain. The first digital-to-analog converter 592 may convert the first baseband signal to the analog domain for processing by the spectral placement module 510. The second digital-to-analog converter 594 may convert the second baseband signal to the analog domain for processing by the second spectral placement module 520 or signal combiner 530. The signal combiner 530 then combines signals in the analog domain to generate an analog composite signal, which is then upconverted and transmitted by the upconverter 540 and RF transmission stage 550, respectively.</p> <p><i>See, e.g., Rofougaran at 9:30-41.</i></p> <p>FIG. 7 is a diagram showing a portion of a seventh non-limiting exemplary communication system 700, in accordance with various aspects of the present invention. The exemplary communication system 700 may, for example and without limitation, share any or all characteristics with the exemplary systems 100-600 illustrated in FIGS. 1-6 and discussed previously.</p> <p>The exemplary communication system 700 may comprise a first mixer 744 that receives a spectrally shifted first baseband signal from the spectral placement module 710 and a first RF mixing signal (e.g., a 2.446 GHz signal generally associated with the Bluetooth communication protocol) from a</p>

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	<p>first local oscillator 742. The exemplary communication system 700 may also comprise a second mixer 748 that receives a second baseband signal (or a spectrally shifted second baseband signal) and a second RF mixing signal (e.g., a 2.486 GHz signal generally associated with the IEEE 802.11(g) communication protocol) from a second local oscillator 746.</p> <p>The exemplary communication system 700 may comprise an RF signal combiner 730 that is adapted to combine input RF signals. The RF signal combiner 730 may, for example, receive and combine the output signals from the first mixer 744 and second mixer 748 to generate an RF composite signal. The exemplary communication system 700 may also comprise a RF transmission stage 750 that receives the RF composite signal from the RF signal combiner 730 and transmit the signal.</p> <p><i>See, e.g.</i>, Rofougaran at 10:18-43.</p> <p>The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 810 comprises receiving the first baseband signal, step 810 may comprise receiving the first baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The first baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 810 may, for example, comprise generating the first baseband signal independently (e.g., corresponding to an independent communication). Step 810 may alternatively, for example, comprise generating the first baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first baseband signal and other baseband signals for a single communication).</p> <p>The exemplary method 800 may, at step 820, comprise spectrally placing (or shifting) the first baseband signal (e.g., received at step 810). Step 820 may, for example and without limitation, share any or all functional characteristics with the spectral placement modules 110-710 of the exemplary systems 100-700 illustrated in FIGS. 1-7 and discussed previously.</p>

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	<p>Step 820 may, for example, comprise spectrally shifting the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with a second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, step 820 may comprise implementing a frequency-hopping scheme with the first baseband signal. For example, in a scenario where there are one or more frequency bands (e.g., a second frequency space) associated with a second baseband signal, step 820 may comprise spectrally shifting the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p>In another non-limiting exemplary scenario, spectrally shifting the first baseband signal may result in the production of a spectral image (e.g., frequency content mirrored about a mixing frequency utilized to spectrally shift the first baseband signal). In such a scenario, step 820 may comprise accepting or rejecting the image.</p> <p>In a scenario where an image is rejected, step 820 may comprise rejecting the image in any of a variety of manners. For example and without limitation, step 820 may comprise performing image reject mixing to spectrally shift the first baseband signal. Such image reject mixing generally comprises spectrally shifting a signal and rejecting an image associated with the spectrally shifted signal. Also for example, step 820 may comprise filtering out an unwanted image. The scope of various aspects of the present invention should not be limited by the utilization of image rejection or by any particular manner of performing such image rejection.</p> <p>The exemplary method 800 may, at step 830, comprise generating and/or receiving a second baseband signal corresponding to a second communication protocol (e.g., different from the first communication protocol). Step 830 may, for example and without limitation, share any or all functional characteristics with the second input 102 of the exemplary system 100 illustrated in FIG. 1 and discussed previously.</p>

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	<p>The second baseband signal may, for example, correspond to a second communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 830 comprises receiving the second baseband signal, step 830 may comprise receiving the second baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 830 may, for example, comprise generating the second baseband signal independently (e.g., corresponding to a communication independent of a communication associated with the first baseband signal). Step 830 may alternatively, for example, comprise generating the second baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the second baseband signal and the first baseband signal for a single communication).</p> <p><i>See, e.g., Rofougaran at 11:53-13:4.</i></p> <p>Furthermore, this claim element is obvious in light of Rofougaran itself, when combined with any of the other references as charted for this claim element in Exs. A-1–A-31, First Supplemental Ex. A-Obviousness Chart, and/or when combined with the knowledge of one of ordinary skill in the art. Motivations to combine may come from the knowledge of the person of ordinary skill themselves, or from the known problems and predictable solutions as embodied in these references. Further motivations to combine references and additional details may be found in the Cover Pleading and First Supplemental Ex. A-Obviousness Chart.</p>
[14.6] down-converting the amplified received up-converted analog signal using a second down-converter and a signal corresponding to the second RF center frequency to produce a fifth analog signal	Rofougaran discloses “down-converting the amplified received up-converted analog signal using a second down-converter and a signal corresponding to the second RF center frequency to produce a fifth analog signal corresponding to the second analog signal.” See, e.g.:

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<p>corresponding to the second analog signal.</p>	<p>The diagram illustrates a signal processing system for spectral placement. It starts with two baseband signals: 'First Baseband Signal' (201) and 'Second Baseband Signal' (202). These signals are processed by a 'Spectral Placement Module' (210). The module outputs signals 211 and 212, which are positioned at frequencies $-f_s$ and f_s respectively. A 'Signal Combiner' (230) combines these signals with other signals from a local oscillator (LO) module. The LO module consists of a local oscillator (246), a mixer (247), and a filter (248). The combined signals are then sent to a power amplifier (PA) (250) and a duplexer (252). The PA outputs signal 250, and the duplexer outputs signal 243 at frequency f_{RF}. Frequency markers $-f_s$, f_s, and f_{RF} are indicated on the frequency axis. The diagram also shows intermediate signals 203, 204, 231, 232, 233, 240, 241, 244, 245, and 247.</p>

Figure 2

See, e.g., Rofougaran at Figure 2.

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	<p>The diagram illustrates a signal processing system for two baseband signals. On the left, a vertical stack of components is shown: a '1st Baseband Signal' input, a 'DAC' block (labeled 592), and a 'Spectral Placement Module' block (labeled 510). A second 'Baseband Signal' input is shown below the first, also connected to a 'DAC' block (labeled 594) and an 'Optional Second Spectral Placement Module' block (labeled 520). The outputs from the DACs and their respective spectral placement modules are combined at a 'Signal Combiner' (labeled 530). The combined signal then passes through an 'Upconverter' (labeled 540) and an 'RF Xmit Stage' (labeled 550) before being transmitted. Reference numerals 500, 510, 520, 530, 540, and 550 are placed near their corresponding components.</p>

Figure 5

See, e.g., Rofougaran at Figure 5.

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	<p>The diagram illustrates a communication system architecture. It starts with two baseband signal inputs: 'First Baseband Signal' and 'Second Baseband Signal'. The 'First Baseband Signal' is processed by a 'Spectral Placement Module' (710). This module is connected to a mixer (744) via a line labeled 700. The mixer also receives a local oscillator signal from 'LO1' (e.g., 2.446 GHz) via line 742. The output of the mixer is fed into an 'RF Signal Combiner' (730) via line 744. The 'Second Baseband Signal' is processed by an 'Optional Second Spectral Placement Module' (720), which is connected to a second mixer (748) via line 720. This mixer receives a local oscillator signal from 'LO2' (e.g., 2.486 GHz) via line 746. The output of the second mixer is also fed into the 'RF Signal Combiner' (730) via line 748. The 'RF Signal Combiner' (730) has a single output line that leads to an 'RF Xmit Stage' (750). The 'RF Xmit Stage' (750) then outputs the final transmitted signal.</p>

Figure 7

See, e.g., Rofougaran at Figure 7.

FIG. 1 is a diagram showing a portion of a first non-limiting exemplary communication system 100, in accordance with various aspects of the present invention. The communication system (or device) may comprise characteristics of any of a variety of communication systems/devices (e.g., multimode wireless communication devices). For example and without limitation, the communication system may comprise characteristics of any of a variety of mobile wireless communication devices (e.g.,

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	<p>cellular phones, paging devices, portable email devices, etc.). Also for example, the communication system may comprise characteristics of fixed communication systems or devices (e.g., network access points, base stations, satellites, wireless routers, set top boxes, etc.). Further for example, the communication system may comprise characteristics of a variety of electronic devices with wireless communication capability (e.g., televisions, music players, cameras, remote controls, personal digital assistants, handheld computers, gaming devices, etc.). Accordingly, the scope of various aspects of the present invention should not be limited by characteristics of particular communication systems or devices.</p> <p>The following discussion will, at times, refer to various communication modes. A multimode communication device may, for example, be adapted to communicate in a plurality of such communication modes. For the following discussion, a communication mode may generally be considered to coincide with communication utilizing a particular communication protocol or standard. A non-limiting list of exemplary communication protocols includes various cellular communication protocols (e.g., GSM, GPRS, EDGE, CDMA, WCDMA, TDMA, PDC, etc.), various wireless networking protocols or standards, including WLAN, WMAN, WPAN and WWAN (e.g., IEEE 802.11, Bluetooth, IEEE 802.15, UWB, IEEE 802.16, IEEE 802.20, Zigbee, any WiFi protocol, etc.), various television communication standards, etc. The scope of various aspects of the present invention should not be limited by characteristics of particular communication modes or protocols, whether standard or proprietary.</p> <p>The exemplary communication system 100 may comprise at least a first input 101 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to any of the previously mentioned communication protocols.</p> <p>The exemplary communication system 100 may also comprise at least a second input 102 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first</p>

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	<p>communication protocol discussed above). For example and without limitation, the second baseband signal may correspond to any of the previously mentioned communication protocols. The first baseband signal and the second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of the communication system 100. For example, such modules may generate the first and second baseband signals independently (e.g., corresponding to independent respective communications). Alternatively, for example, such modules may generate the first and second baseband signals in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first and second baseband signals for a single communication).</p> <p>The exemplary communication system 100 may additionally comprise a spectral placement module 110 that is adapted to spectrally shift the first baseband signal (i.e., shift the frequency spectrum of the first baseband signal). In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to spectrally shift the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with the second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to implement a frequency-hopping scheme with the first baseband signal. For example, in a scenario, where there are one or more frequency bands (e.g., a second frequency space) associated with the second baseband signal, the spectral placement module 110 may be adapted to shift the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p><i>See, e.g., Rofougaran at 2:38-3:58.</i></p> <p>The exemplary communication system 100 may also comprise a second spectral placement module 120. Such a second spectral placement module 120 may, for example, share any or all characteristics</p>

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	<p>with the spectral placement module 110 discussed previously. The incorporation of such a second spectral placement module 120 may, for example, provide spectral shifting flexibility. For example, in such an exemplary configuration, either or both of the first and second baseband signals may be spectrally shifted to substantially distinct frequency spaces. Also for example, in such an exemplary configuration, either or both of the first and second baseband signals may be frequency hopped. Note that though the second spectral placement module 120 is illustrated separate from the first spectral placement module 110, the second spectral placement module 120 may share any or all hardware and/or software components with the spectral placement module 110.</p> <p>The exemplary communication system 100 may further comprise a signal combiner 130 that is adapted to generate a composite signal comprising various input signals to the signal combiner 130. For example, the composite signal may simultaneously (i.e., at an instant in time) comprise components associated with various input signals. Note that such simultaneity need not always be present. For example, at a first instant in time, the signal output from the signal combiner 130 might comprise a plurality of components associated with a plurality of respective input signals, at a second instant in time, the signal output from the signal combiner 130 might comprise a single component associated with a single respective input signal, and at a third instant in time, the signal output from the signal combiner 130 might comprise no components.</p> <p>In a first non-limiting exemplary scenario, the signal combiner 130 may receive a first signal that is based on the first baseband signal (e.g., associated with a first communication protocol). Also, the signal combiner 130 may receive a second signal that is based on the second baseband signal (e.g., associated with a second communication protocol). In such a scenario, the signal combiner 130 may combine the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the first baseband signal and a second signal component based on the second baseband signal. In such a scenario, for example where the frequency spectra of the first and second baseband signals do not overlap, the first and second baseband signals might not be spectrally shifted prior to combining by the signal combiner 130. In such a scenario, the spectral placement module 110 (and optionally, the second spectral placement module 120) may receive a control signal indicating whether or not to perform spectral shifting and/or to what degree spectral shifting should be implemented.</p>

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	<p><i>See, e.g.</i>, Rofougaran at 4:16-67.</p> <p>Various components of the exemplary communication system 100 (and other communication systems illustrated and discussed herein) may be implemented in analog and/or digital circuitry. To illustrate this, the exemplary communication system 100 is not shown with analog-to-digital converters (ADCs) or digital-to-analog converters (DACs). FIGS. 4-6, to be discussed later, show various non-limiting exemplary configurations including such converters.</p> <p>FIG. 2 is a diagram showing a portion of a second non-limiting exemplary communication system 200, in accordance with various aspects of the present invention. The communication system 200 may, for example and without limitation, share any or all characteristics with the communication system 100 illustrated in FIG. 1 and discussed previously.</p> <p>The exemplary communication system 200 may comprise at least a first input 201 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to the Bluetooth communication protocol. FIG. 2 shows an exemplary frequency spectrum 203 associated with the first baseband signal.</p> <p>The exemplary communication system 200 may also comprise at least a second input 202 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first communication protocol discussed above). For example and without limitation, the first baseband signal may correspond to an IEEE 802.11 communication protocol (e.g., IEEE 802.11(b) or IEEE 802.11(g)). FIG. 2 shows an exemplary frequency spectrum 204 associated with the second baseband signal.</p> <p><i>See, e.g.</i>, Rofougaran at 5:64-6:31.</p>

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	<p>In a non-limiting exemplary configuration illustrated in FIG. 2, the signal combiner 230 receives a first signal from the spectral placement module 210 that is based on the spectrally shifted first baseband signal. Also, the signal combiner 230 receives a second signal that is based on the second baseband signal. In such a configuration, the signal combiner 230 combines the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the spectrally shifted first baseband signal and a second signal component based on the second baseband signal (e.g., not spectrally shifted).</p> <p>FIG. 2 shows an exemplary frequency spectrum 231 associated with the composite signal formed by the signal combiner 230. The spectrum 231 comprises a first portion 233 corresponding to the first signal component, and a second portion 232 corresponding to the second signal component. Note that the first portion 233 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 232.</p> <p>The exemplary communication system 200 may also comprise an upconverter 240 adapted to upconvert a signal (e.g., the composite signal from the signal combiner 230) for transmission. The upconverter 240 may, for example and without limitation, share any or all characteristics with the upconverter 140 discussed previously.</p> <p>The upconverter 240 may, for example, comprise a mixer 247, a local oscillator 246 and one or more filters 248. The mixer 247 may, for example, receive the composite signal from the signal combiner 230 and an RF mixing signal at frequency fRF from a local oscillator 246. The upconverter 240 may, for example, filter the upconverted signal from the mixer 247 with one or more filters 248. The output of the upconverter 240 may, for example, comprise a signal indicative of the composite signal spectrally shifted to an RF frequency.</p> <p>FIG. 2 shows an exemplary frequency spectrum 241 associated with the RF signal formed by the upconverter 240. The frequency spectrum 241 comprises a first portion 243 corresponding to the first signal component and a second portion 242 corresponding to the second signal component. Note that the first portion 243 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 242. Also note that the first portion 243 and</p>

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	<p>second portion 242 might be formed with a first mirror portion 244 and second mirror portion 245, respectively. Note that a mirror portion may either be removed or may be kept for later processing. The exemplary communication system 200 may further comprise a RF transmission stage 250 adapted to transmit an RF signal. The RF transmission stage 250 may, for example and without limitation, share any or all characteristics with the RF transmission stage 150 discussed previously. Such an RF signal may, for example, be associated with the composite signal output from the signal combiner 230 and upconverted by the upconverter 240. The RF transmission stage 250 may, for example and without limitation, comprise a power amplifier 252, antenna 254 and other components generally associated with RF signal transmission.</p> <p><i>See, e.g., Rofougaran at 6:66-7:57.</i></p> <p>For example, the spectral placement module 510, optional second spectral placement module 520 and signal combiner 530 may operate in the analog domain. The first digital-to-analog converter 592 may convert the first baseband signal to the analog domain for processing by the spectral placement module 510. The second digital-to-analog converter 594 may convert the second baseband signal to the analog domain for processing by the second spectral placement module 520 or signal combiner 530. The signal combiner 530 then combines signals in the analog domain to generate an analog composite signal, which is then upconverted and transmitted by the upconverter 540 and RF transmission stage 550, respectively.</p> <p><i>See, e.g., Rofougaran at 9:30-41.</i></p> <p>FIG. 7 is a diagram showing a portion of a seventh non-limiting exemplary communication system 700, in accordance with various aspects of the present invention. The exemplary communication system 700 may, for example and without limitation, share any or all characteristics with the exemplary systems 100-600 illustrated in FIGS. 1-6 and discussed previously.</p> <p>The exemplary communication system 700 may comprise a first mixer 744 that receives a spectrally shifted first baseband signal from the spectral placement module 710 and a first RF mixing signal (e.g., a 2.446 GHz signal generally associated with the Bluetooth communication protocol) from a</p>

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	<p>first local oscillator 742. The exemplary communication system 700 may also comprise a second mixer 748 that receives a second baseband signal (or a spectrally shifted second baseband signal) and a second RF mixing signal (e.g., a 2.486 GHz signal generally associated with the IEEE 802.11(g) communication protocol) from a second local oscillator 746.</p> <p>The exemplary communication system 700 may comprise an RF signal combiner 730 that is adapted to combine input RF signals. The RF signal combiner 730 may, for example, receive and combine the output signals from the first mixer 744 and second mixer 748 to generate an RF composite signal. The exemplary communication system 700 may also comprise a RF transmission stage 750 that receives the RF composite signal from the RF signal combiner 730 and transmit the signal.</p> <p><i>See, e.g., Rofougaran at 10:18-43.</i></p> <p>The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 810 comprises receiving the first baseband signal, step 810 may comprise receiving the first baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The first baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 810 may, for example, comprise generating the first baseband signal independently (e.g., corresponding to an independent communication). Step 810 may alternatively, for example, comprise generating the first baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first baseband signal and other baseband signals for a single communication).</p> <p>The exemplary method 800 may, at step 820, comprise spectrally placing (or shifting) the first baseband signal (e.g., received at step 810). Step 820 may, for example and without limitation, share any or all functional characteristics with the spectral placement modules 110-710 of the exemplary systems 100-700 illustrated in FIGS. 1-7 and discussed previously.</p>

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	<p>Step 820 may, for example, comprise spectrally shifting the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with a second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, step 820 may comprise implementing a frequency-hopping scheme with the first baseband signal. For example, in a scenario where there are one or more frequency bands (e.g., a second frequency space) associated with a second baseband signal, step 820 may comprise spectrally shifting the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p>In another non-limiting exemplary scenario, spectrally shifting the first baseband signal may result in the production of a spectral image (e.g., frequency content mirrored about a mixing frequency utilized to spectrally shift the first baseband signal). In such a scenario, step 820 may comprise accepting or rejecting the image.</p> <p>In a scenario where an image is rejected, step 820 may comprise rejecting the image in any of a variety of manners. For example and without limitation, step 820 may comprise performing image reject mixing to spectrally shift the first baseband signal. Such image reject mixing generally comprises spectrally shifting a signal and rejecting an image associated with the spectrally shifted signal. Also for example, step 820 may comprise filtering out an unwanted image. The scope of various aspects of the present invention should not be limited by the utilization of image rejection or by any particular manner of performing such image rejection.</p> <p>The exemplary method 800 may, at step 830, comprise generating and/or receiving a second baseband signal corresponding to a second communication protocol (e.g., different from the first communication protocol). Step 830 may, for example and without limitation, share any or all functional characteristics with the second input 102 of the exemplary system 100 illustrated in FIG. 1 and discussed previously.</p>

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	<p>The second baseband signal may, for example, correspond to a second communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 830 comprises receiving the second baseband signal, step 830 may comprise receiving the second baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 830 may, for example, comprise generating the second baseband signal independently (e.g., corresponding to a communication independent of a communication associated with the first baseband signal). Step 830 may alternatively, for example, comprise generating the second baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the second baseband signal and the first baseband signal for a single communication).</p> <p><i>See, e.g., Rofougaran at 11:53-13:4.</i></p> <p>Furthermore, this claim element is obvious in light of Rofougaran itself, when combined with any of the other references as charted for this claim element in Exs. A-1–A-31, First Supplemental Ex. A-Obviousness Chart, and/or when combined with the knowledge of one of ordinary skill in the art. Motivations to combine may come from the knowledge of the person of ordinary skill themselves, or from the known problems and predictable solutions as embodied in these references. Further motivations to combine references and additional details may be found in the Cover Pleading and First Supplemental Ex. A-Obviousness Chart.</p>

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[17.1] A wireless communication system comprising:	To the extent the preamble is limiting, Rofougaran discloses “A wireless communication system comprising.” See, e.g.:

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	<p>FIG. 1 is a diagram showing a portion of a first non-limiting exemplary communication system 100, in accordance with various aspects of the present invention. The communication system (or device) may comprise characteristics of any of a variety of communication systems/devices (e.g., multimode wireless communication devices). For example and without limitation, the communication system may comprise characteristics of any of a variety of mobile wireless communication devices (e.g., cellular phones, paging devices, portable email devices, etc.). Also for example, the communication system may comprise characteristics of fixed communication systems or devices (e.g., network access points, base stations, satellites, wireless routers, set top boxes, etc.). Further for example, the communication system may comprise characteristics of a variety of electronic devices with wireless communication capability (e.g., televisions, music players, cameras, remote controls, personal digital assistants, handheld computers, gaming devices, etc.). Accordingly, the scope of various aspects of the present invention should not be limited by characteristics of particular communication systems or devices.</p> <p>The following discussion will, at times, refer to various communication modes. A multimode communication device may, for example, be adapted to communicate in a plurality of such communication modes. For the following discussion, a communication mode may generally be considered to coincide with communication utilizing a particular communication protocol or standard. A non-limiting list of exemplary communication protocols includes various cellular communication protocols (e.g., GSM, GPRS, EDGE, CDMA, WCDMA, TDMA, PDC, etc.), various wireless networking protocols or standards, including WLAN, WMAN, WPAN and WWAN (e.g., IEEE 802.11, Bluetooth, IEEE 802.15, UWB, IEEE 802.16, IEEE 802.20, Zigbee, any WiFi protocol, etc.), various television communication standards, etc. The scope of various aspects of the present invention should not be limited by characteristics of particular communication modes or protocols, whether standard or proprietary.</p> <p><i>See, e.g., Rofougaran at 2:36-3:6.</i></p> <p>Furthermore, this claim element is obvious in light of Rofougaran itself, when combined with any of the other references as charted for this claim element in Exs. A-1–A-31, First Supplemental Ex. A–Obviousness Chart, and/or when combined with the knowledge of one of ordinary skill in the art.</p>

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[17.2] a baseband digital system for providing a first digital signal comprising a first data to be transmitted and a second digital signal comprising a second data to be transmitted;	<p>Motivations to combine may come from the knowledge of the person of ordinary skill themselves, or from the known problems and predictable solutions as embodied in these references. Further motivations to combine references and additional details may be found in the Cover Pleading and First Supplemental Ex. A-Obviousness Chart.</p> <p>Rofougaran discloses “a baseband digital system for providing a first digital signal comprising a first data to be transmitted and a second digital signal comprising a second data to be transmitted.” See, e.g.:</p> <p>Figure 2</p> <p>See, e.g., Rofougaran at Figure 2.</p>

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	<p>The diagram illustrates a signal processing chain for RF transmission. It begins with two baseband signals: the 1st Baseband Signal and the 2nd Baseband Signal. These signals are processed by two DACs (Digital-to-Analog Converters), labeled 592 and 594. The outputs of the DACs are fed into a Spectral Placement Module (510) and an optional second spectral placement module (520). The outputs from the modules are combined at a Signal Combiner (530). The combined signal then passes through an Upconverter (540) and an RF Xmit Stage (550) before being transmitted.</p> <p>Figure 5</p> <p><i>See, e.g., Rofougaran at Figure 5.</i></p>

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	<p>The diagram illustrates a communication system architecture. A 'First Baseband Signal' enters a 'Spectral Placement Module' (710). A 'Second Baseband Signal' enters an 'Optional Second Spectral Placement Module' (720). Both modules output signals to mixers. The mixer for the first module receives a local oscillator signal from 'LO1' (e.g., 2.446 GHz) labeled 742. The mixer for the second module receives a local oscillator signal from 'LO2' (e.g., 2.486 GHz) labeled 746. The outputs of the mixers feed into an 'RF Signal Combiner' (730), which then connects to an 'RF Xmit Stage' (750) for transmission.</p>

Figure 7

See, e.g., Rofougaran at Figure 7.

FIG. 1 is a diagram showing a portion of a first non-limiting exemplary communication system 100, in accordance with various aspects of the present invention. The communication system (or device) may comprise characteristics of any of a variety of communication systems/devices (e.g., multimode wireless communication devices). For example and without limitation, the communication system may comprise characteristics of any of a variety of mobile wireless communication devices (e.g.,

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	<p>cellular phones, paging devices, portable email devices, etc.). Also for example, the communication system may comprise characteristics of fixed communication systems or devices (e.g., network access points, base stations, satellites, wireless routers, set top boxes, etc.). Further for example, the communication system may comprise characteristics of a variety of electronic devices with wireless communication capability (e.g., televisions, music players, cameras, remote controls, personal digital assistants, handheld computers, gaming devices, etc.). Accordingly, the scope of various aspects of the present invention should not be limited by characteristics of particular communication systems or devices.</p> <p>The following discussion will, at times, refer to various communication modes. A multimode communication device may, for example, be adapted to communicate in a plurality of such communication modes. For the following discussion, a communication mode may generally be considered to coincide with communication utilizing a particular communication protocol or standard. A non-limiting list of exemplary communication protocols includes various cellular communication protocols (e.g., GSM, GPRS, EDGE, CDMA, WCDMA, TDMA, PDC, etc.), various wireless networking protocols or standards, including WLAN, WMAN, WPAN and WWAN (e.g., IEEE 802.11, Bluetooth, IEEE 802.15, UWB, IEEE 802.16, IEEE 802.20, Zigbee, any WiFi protocol, etc.), various television communication standards, etc. The scope of various aspects of the present invention should not be limited by characteristics of particular communication modes or protocols, whether standard or proprietary.</p> <p>The exemplary communication system 100 may comprise at least a first input 101 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to any of the previously mentioned communication protocols.</p> <p>The exemplary communication system 100 may also comprise at least a second input 102 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first</p>

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	<p>communication protocol discussed above). For example and without limitation, the second baseband signal may correspond to any of the previously mentioned communication protocols. The first baseband signal and the second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of the communication system 100. For example, such modules may generate the first and second baseband signals independently (e.g., corresponding to independent respective communications). Alternatively, for example, such modules may generate the first and second baseband signals in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first and second baseband signals for a single communication).</p> <p>The exemplary communication system 100 may additionally comprise a spectral placement module 110 that is adapted to spectrally shift the first baseband signal (i.e., shift the frequency spectrum of the first baseband signal). In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to spectrally shift the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with the second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to implement a frequency-hopping scheme with the first baseband signal. For example, in a scenario, where there are one or more frequency bands (e.g., a second frequency space) associated with the second baseband signal, the spectral placement module 110 may be adapted to shift the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p><i>See, e.g., Rofougaran at 2:38-3:58.</i></p> <p>The exemplary communication system 100 may also comprise a second spectral placement module 120. Such a second spectral placement module 120 may, for example, share any or all characteristics</p>

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	<p>with the spectral placement module 110 discussed previously. The incorporation of such a second spectral placement module 120 may, for example, provide spectral shifting flexibility. For example, in such an exemplary configuration, either or both of the first and second baseband signals may be spectrally shifted to substantially distinct frequency spaces. Also for example, in such an exemplary configuration, either or both of the first and second baseband signals may be frequency hopped. Note that though the second spectral placement module 120 is illustrated separate from the first spectral placement module 110, the second spectral placement module 120 may share any or all hardware and/or software components with the spectral placement module 110.</p> <p>The exemplary communication system 100 may further comprise a signal combiner 130 that is adapted to generate a composite signal comprising various input signals to the signal combiner 130. For example, the composite signal may simultaneously (i.e., at an instant in time) comprise components associated with various input signals. Note that such simultaneity need not always be present. For example, at a first instant in time, the signal output from the signal combiner 130 might comprise a plurality of components associated with a plurality of respective input signals, at a second instant in time, the signal output from the signal combiner 130 might comprise a single component associated with a single respective input signal, and at a third instant in time, the signal output from the signal combiner 130 might comprise no components.</p> <p>In a first non-limiting exemplary scenario, the signal combiner 130 may receive a first signal that is based on the first baseband signal (e.g., associated with a first communication protocol). Also, the signal combiner 130 may receive a second signal that is based on the second baseband signal (e.g., associated with a second communication protocol). In such a scenario, the signal combiner 130 may combine the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the first baseband signal and a second signal component based on the second baseband signal. In such a scenario, for example where the frequency spectra of the first and second baseband signals do not overlap, the first and second baseband signals might not be spectrally shifted prior to combining by the signal combiner 130. In such a scenario, the spectral placement module 110 (and optionally, the second spectral placement module 120) may receive a control signal indicating whether or not to perform spectral shifting and/or to what degree spectral shifting should be implemented.</p>

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	<p><i>See, e.g.</i>, Rofougaran at 4:16-67.</p> <p>Various components of the exemplary communication system 100 (and other communication systems illustrated and discussed herein) may be implemented in analog and/or digital circuitry. To illustrate this, the exemplary communication system 100 is not shown with analog-to-digital converters (ADCs) or digital-to-analog converters (DACs). FIGS. 4-6, to be discussed later, show various non-limiting exemplary configurations including such converters.</p> <p>FIG. 2 is a diagram showing a portion of a second non-limiting exemplary communication system 200, in accordance with various aspects of the present invention. The communication system 200 may, for example and without limitation, share any or all characteristics with the communication system 100 illustrated in FIG. 1 and discussed previously.</p> <p>The exemplary communication system 200 may comprise at least a first input 201 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to the Bluetooth communication protocol. FIG. 2 shows an exemplary frequency spectrum 203 associated with the first baseband signal.</p> <p>The exemplary communication system 200 may also comprise at least a second input 202 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first communication protocol discussed above). For example and without limitation, the first baseband signal may correspond to an IEEE 802.11 communication protocol (e.g., IEEE 802.11(b) or IEEE 802.11(g)). FIG. 2 shows an exemplary frequency spectrum 204 associated with the second baseband signal.</p> <p><i>See, e.g.</i>, Rofougaran at 5:64-6:31.</p>

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	<p>In a non-limiting exemplary configuration illustrated in FIG. 2, the signal combiner 230 receives a first signal from the spectral placement module 210 that is based on the spectrally shifted first baseband signal. Also, the signal combiner 230 receives a second signal that is based on the second baseband signal. In such a configuration, the signal combiner 230 combines the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the spectrally shifted first baseband signal and a second signal component based on the second baseband signal (e.g., not spectrally shifted).</p> <p>FIG. 2 shows an exemplary frequency spectrum 231 associated with the composite signal formed by the signal combiner 230. The spectrum 231 comprises a first portion 233 corresponding to the first signal component, and a second portion 232 corresponding to the second signal component. Note that the first portion 233 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 232.</p> <p>The exemplary communication system 200 may also comprise an upconverter 240 adapted to upconvert a signal (e.g., the composite signal from the signal combiner 230) for transmission. The upconverter 240 may, for example and without limitation, share any or all characteristics with the upconverter 140 discussed previously.</p> <p>The upconverter 240 may, for example, comprise a mixer 247, a local oscillator 246 and one or more filters 248. The mixer 247 may, for example, receive the composite signal from the signal combiner 230 and an RF mixing signal at frequency fRF from a local oscillator 246. The upconverter 240 may, for example, filter the upconverted signal from the mixer 247 with one or more filters 248. The output of the upconverter 240 may, for example, comprise a signal indicative of the composite signal spectrally shifted to an RF frequency.</p> <p>FIG. 2 shows an exemplary frequency spectrum 241 associated with the RF signal formed by the upconverter 240. The frequency spectrum 241 comprises a first portion 243 corresponding to the first signal component and a second portion 242 corresponding to the second signal component. Note that the first portion 243 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 242. Also note that the first portion 243 and</p>

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	<p>second portion 242 might be formed with a first mirror portion 244 and second mirror portion 245, respectively. Note that a mirror portion may either be removed or may be kept for later processing. The exemplary communication system 200 may further comprise a RF transmission stage 250 adapted to transmit an RF signal. The RF transmission stage 250 may, for example and without limitation, share any or all characteristics with the RF transmission stage 150 discussed previously. Such an RF signal may, for example, be associated with the composite signal output from the signal combiner 230 and upconverted by the upconverter 240. The RF transmission stage 250 may, for example and without limitation, comprise a power amplifier 252, antenna 254 and other components generally associated with RF signal transmission.</p> <p><i>See, e.g., Rofougaran at 6:66-7:57.</i></p> <p>For example, the spectral placement module 510, optional second spectral placement module 520 and signal combiner 530 may operate in the analog domain. The first digital-to-analog converter 592 may convert the first baseband signal to the analog domain for processing by the spectral placement module 510. The second digital-to-analog converter 594 may convert the second baseband signal to the analog domain for processing by the second spectral placement module 520 or signal combiner 530. The signal combiner 530 then combines signals in the analog domain to generate an analog composite signal, which is then upconverted and transmitted by the upconverter 540 and RF transmission stage 550, respectively.</p> <p><i>See, e.g., Rofougaran at 9:30-41.</i></p> <p>FIG. 7 is a diagram showing a portion of a seventh non-limiting exemplary communication system 700, in accordance with various aspects of the present invention. The exemplary communication system 700 may, for example and without limitation, share any or all characteristics with the exemplary systems 100-600 illustrated in FIGS. 1-6 and discussed previously.</p> <p>The exemplary communication system 700 may comprise a first mixer 744 that receives a spectrally shifted first baseband signal from the spectral placement module 710 and a first RF mixing signal (e.g., a 2.446 GHz signal generally associated with the Bluetooth communication protocol) from a</p>

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	<p>first local oscillator 742. The exemplary communication system 700 may also comprise a second mixer 748 that receives a second baseband signal (or a spectrally shifted second baseband signal) and a second RF mixing signal (e.g., a 2.486 GHz signal generally associated with the IEEE 802.11(g) communication protocol) from a second local oscillator 746.</p> <p>The exemplary communication system 700 may comprise an RF signal combiner 730 that is adapted to combine input RF signals. The RF signal combiner 730 may, for example, receive and combine the output signals from the first mixer 744 and second mixer 748 to generate an RF composite signal. The exemplary communication system 700 may also comprise a RF transmission stage 750 that receives the RF composite signal from the RF signal combiner 730 and transmit the signal.</p> <p><i>See, e.g., Rofougaran at 10:18-43.</i></p> <p>The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 810 comprises receiving the first baseband signal, step 810 may comprise receiving the first baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The first baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 810 may, for example, comprise generating the first baseband signal independently (e.g., corresponding to an independent communication). Step 810 may alternatively, for example, comprise generating the first baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first baseband signal and other baseband signals for a single communication).</p> <p>The exemplary method 800 may, at step 820, comprise spectrally placing (or shifting) the first baseband signal (e.g., received at step 810). Step 820 may, for example and without limitation, share any or all functional characteristics with the spectral placement modules 110-710 of the exemplary systems 100-700 illustrated in FIGS. 1-7 and discussed previously.</p>

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	<p>Step 820 may, for example, comprise spectrally shifting the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with a second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, step 820 may comprise implementing a frequency-hopping scheme with the first baseband signal. For example, in a scenario where there are one or more frequency bands (e.g., a second frequency space) associated with a second baseband signal, step 820 may comprise spectrally shifting the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p>In another non-limiting exemplary scenario, spectrally shifting the first baseband signal may result in the production of a spectral image (e.g., frequency content mirrored about a mixing frequency utilized to spectrally shift the first baseband signal). In such a scenario, step 820 may comprise accepting or rejecting the image.</p> <p>In a scenario where an image is rejected, step 820 may comprise rejecting the image in any of a variety of manners. For example and without limitation, step 820 may comprise performing image reject mixing to spectrally shift the first baseband signal. Such image reject mixing generally comprises spectrally shifting a signal and rejecting an image associated with the spectrally shifted signal. Also for example, step 820 may comprise filtering out an unwanted image. The scope of various aspects of the present invention should not be limited by the utilization of image rejection or by any particular manner of performing such image rejection.</p> <p>The exemplary method 800 may, at step 830, comprise generating and/or receiving a second baseband signal corresponding to a second communication protocol (e.g., different from the first communication protocol). Step 830 may, for example and without limitation, share any or all functional characteristics with the second input 102 of the exemplary system 100 illustrated in FIG. 1 and discussed previously.</p>

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	<p>The second baseband signal may, for example, correspond to a second communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 830 comprises receiving the second baseband signal, step 830 may comprise receiving the second baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 830 may, for example, comprise generating the second baseband signal independently (e.g., corresponding to a communication independent of a communication associated with the first baseband signal). Step 830 may alternatively, for example, comprise generating the second baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the second baseband signal and the first baseband signal for a single communication).</p> <p><i>See, e.g., Rofougaran at 11:53-13:4.</i></p> <p>Furthermore, this claim element is obvious in light of Rofougaran itself, when combined with any of the other references as charted for this claim element in Exs. A-1–A-31, First Supplemental Ex. A-Obviousness Chart, and/or when combined with the knowledge of one of ordinary skill in the art. Motivations to combine may come from the knowledge of the person of ordinary skill themselves, or from the known problems and predictable solutions as embodied in these references. Further motivations to combine references and additional details may be found in the Cover Pleading and First Supplemental Ex. A-Obviousness Chart.</p>
[17.3] a first digital-to-analog converter for receiving the first digital signal and converting the first digital signal into a first analog signal, the first analog signal carrying the first data across a first frequency range;	Rofougaran discloses “a first digital-to-analog converter for receiving the first digital signal and converting the first digital signal into a first analog signal, the first analog signal carrying the first data across a first frequency range.” See, e.g.:

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	<p>The diagram illustrates a signal processing system for spectral placement. It starts with two baseband signals: 'First Baseband Signal' (201) and 'Second Baseband Signal' (202), which are fed into a 'Spectral Placement Module' (210). This module outputs signals 211 and 212, which are positioned at frequencies $-f_s$ and f_s relative to a sampling frequency f_s. These signals are then combined by a 'Signal Combiner' (230). The combined signal 247 is fed into a mixer (246) along with a 'Local Oscillator' (LO) signal 246. The mixer also includes a low-pass filter (248). The output of the mixer 247 is then processed by a power amplifier (PA) (250) and transmitted via an antenna (252). A reference spectrum is shown at the bottom, featuring signals 231, 232, and 233 centered around f_s, and signals 244, 245, and 241 centered around f_{RF}.</p>

Figure 2

See, e.g., Rofougaran at Figure 2.

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	<p>The diagram illustrates a signal processing chain for RF transmission. It begins with two baseband signals: the 1st Baseband Signal and the 2nd Baseband Signal. These signals are processed by two DACs (Digital-to-Analog Converters), labeled 592 and 594. The outputs of the DACs are fed into a Spectral Placement Module (510) and an optional second spectral placement module (520). The outputs from the modules are combined at a Signal Combiner (530). The combined signal then passes through an Upconverter (540) and an RF Xmit Stage (550) before being transmitted.</p>

Figure 5

See, e.g., Rofougaran at Figure 5.

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	<p>The diagram illustrates a communication system architecture. It begins with two input signals: a "First Baseband Signal" and a "Second Baseband Signal". The First Baseband Signal is processed by a "Spectral Placement Module" (710). This module is connected to a local oscillator "LO1" (e.g., 2.446 GHz) via a mixer (744). The Second Baseband Signal is processed by an "Optional Second Spectral Placement Module" (720), which is also connected to "LO1" via a mixer (748). Both mixers output signals to a central "RF Signal Combiner" (730). The output of the RF Signal Combiner is then processed by an "RF Xmit Stage" (750) before being transmitted.</p>

Figure 7

See, e.g., Rofougaran at Figure 7.

FIG. 1 is a diagram showing a portion of a first non-limiting exemplary communication system 100, in accordance with various aspects of the present invention. The communication system (or device) may comprise characteristics of any of a variety of communication systems/devices (e.g., multimode wireless communication devices). For example and without limitation, the communication system may comprise characteristics of any of a variety of mobile wireless communication devices (e.g.,

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	<p>cellular phones, paging devices, portable email devices, etc.). Also for example, the communication system may comprise characteristics of fixed communication systems or devices (e.g., network access points, base stations, satellites, wireless routers, set top boxes, etc.). Further for example, the communication system may comprise characteristics of a variety of electronic devices with wireless communication capability (e.g., televisions, music players, cameras, remote controls, personal digital assistants, handheld computers, gaming devices, etc.). Accordingly, the scope of various aspects of the present invention should not be limited by characteristics of particular communication systems or devices.</p> <p>The following discussion will, at times, refer to various communication modes. A multimode communication device may, for example, be adapted to communicate in a plurality of such communication modes. For the following discussion, a communication mode may generally be considered to coincide with communication utilizing a particular communication protocol or standard. A non-limiting list of exemplary communication protocols includes various cellular communication protocols (e.g., GSM, GPRS, EDGE, CDMA, WCDMA, TDMA, PDC, etc.), various wireless networking protocols or standards, including WLAN, WMAN, WPAN and WWAN (e.g., IEEE 802.11, Bluetooth, IEEE 802.15, UWB, IEEE 802.16, IEEE 802.20, Zigbee, any WiFi protocol, etc.), various television communication standards, etc. The scope of various aspects of the present invention should not be limited by characteristics of particular communication modes or protocols, whether standard or proprietary.</p> <p>The exemplary communication system 100 may comprise at least a first input 101 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to any of the previously mentioned communication protocols.</p> <p>The exemplary communication system 100 may also comprise at least a second input 102 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first</p>

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	<p>communication protocol discussed above). For example and without limitation, the second baseband signal may correspond to any of the previously mentioned communication protocols. The first baseband signal and the second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of the communication system 100. For example, such modules may generate the first and second baseband signals independently (e.g., corresponding to independent respective communications). Alternatively, for example, such modules may generate the first and second baseband signals in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first and second baseband signals for a single communication).</p> <p>The exemplary communication system 100 may additionally comprise a spectral placement module 110 that is adapted to spectrally shift the first baseband signal (i.e., shift the frequency spectrum of the first baseband signal). In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to spectrally shift the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with the second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to implement a frequency-hopping scheme with the first baseband signal. For example, in a scenario, where there are one or more frequency bands (e.g., a second frequency space) associated with the second baseband signal, the spectral placement module 110 may be adapted to shift the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p><i>See, e.g., Rofougaran at 2:38-3:58.</i></p> <p>The exemplary communication system 100 may also comprise a second spectral placement module 120. Such a second spectral placement module 120 may, for example, share any or all characteristics</p>

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	<p>with the spectral placement module 110 discussed previously. The incorporation of such a second spectral placement module 120 may, for example, provide spectral shifting flexibility. For example, in such an exemplary configuration, either or both of the first and second baseband signals may be spectrally shifted to substantially distinct frequency spaces. Also for example, in such an exemplary configuration, either or both of the first and second baseband signals may be frequency hopped. Note that though the second spectral placement module 120 is illustrated separate from the first spectral placement module 110, the second spectral placement module 120 may share any or all hardware and/or software components with the spectral placement module 110.</p> <p>The exemplary communication system 100 may further comprise a signal combiner 130 that is adapted to generate a composite signal comprising various input signals to the signal combiner 130. For example, the composite signal may simultaneously (i.e., at an instant in time) comprise components associated with various input signals. Note that such simultaneity need not always be present. For example, at a first instant in time, the signal output from the signal combiner 130 might comprise a plurality of components associated with a plurality of respective input signals, at a second instant in time, the signal output from the signal combiner 130 might comprise a single component associated with a single respective input signal, and at a third instant in time, the signal output from the signal combiner 130 might comprise no components.</p> <p>In a first non-limiting exemplary scenario, the signal combiner 130 may receive a first signal that is based on the first baseband signal (e.g., associated with a first communication protocol). Also, the signal combiner 130 may receive a second signal that is based on the second baseband signal (e.g., associated with a second communication protocol). In such a scenario, the signal combiner 130 may combine the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the first baseband signal and a second signal component based on the second baseband signal. In such a scenario, for example where the frequency spectra of the first and second baseband signals do not overlap, the first and second baseband signals might not be spectrally shifted prior to combining by the signal combiner 130. In such a scenario, the spectral placement module 110 (and optionally, the second spectral placement module 120) may receive a control signal indicating whether or not to perform spectral shifting and/or to what degree spectral shifting should be implemented.</p>

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	<p><i>See, e.g.</i>, Rofougaran at 4:16-67.</p> <p>Various components of the exemplary communication system 100 (and other communication systems illustrated and discussed herein) may be implemented in analog and/or digital circuitry. To illustrate this, the exemplary communication system 100 is not shown with analog-to-digital converters (ADCs) or digital-to-analog converters (DACs). FIGS. 4-6, to be discussed later, show various non-limiting exemplary configurations including such converters.</p> <p>FIG. 2 is a diagram showing a portion of a second non-limiting exemplary communication system 200, in accordance with various aspects of the present invention. The communication system 200 may, for example and without limitation, share any or all characteristics with the communication system 100 illustrated in FIG. 1 and discussed previously.</p> <p>The exemplary communication system 200 may comprise at least a first input 201 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to the Bluetooth communication protocol. FIG. 2 shows an exemplary frequency spectrum 203 associated with the first baseband signal.</p> <p>The exemplary communication system 200 may also comprise at least a second input 202 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first communication protocol discussed above). For example and without limitation, the first baseband signal may correspond to an IEEE 802.11 communication protocol (e.g., IEEE 802.11(b) or IEEE 802.11(g)). FIG. 2 shows an exemplary frequency spectrum 204 associated with the second baseband signal.</p> <p><i>See, e.g.</i>, Rofougaran at 5:64-6:31.</p>

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	<p>In a non-limiting exemplary configuration illustrated in FIG. 2, the signal combiner 230 receives a first signal from the spectral placement module 210 that is based on the spectrally shifted first baseband signal. Also, the signal combiner 230 receives a second signal that is based on the second baseband signal. In such a configuration, the signal combiner 230 combines the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the spectrally shifted first baseband signal and a second signal component based on the second baseband signal (e.g., not spectrally shifted).</p> <p>FIG. 2 shows an exemplary frequency spectrum 231 associated with the composite signal formed by the signal combiner 230. The spectrum 231 comprises a first portion 233 corresponding to the first signal component, and a second portion 232 corresponding to the second signal component. Note that the first portion 233 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 232.</p> <p>The exemplary communication system 200 may also comprise an upconverter 240 adapted to upconvert a signal (e.g., the composite signal from the signal combiner 230) for transmission. The upconverter 240 may, for example and without limitation, share any or all characteristics with the upconverter 140 discussed previously.</p> <p>The upconverter 240 may, for example, comprise a mixer 247, a local oscillator 246 and one or more filters 248. The mixer 247 may, for example, receive the composite signal from the signal combiner 230 and an RF mixing signal at frequency fRF from a local oscillator 246. The upconverter 240 may, for example, filter the upconverted signal from the mixer 247 with one or more filters 248. The output of the upconverter 240 may, for example, comprise a signal indicative of the composite signal spectrally shifted to an RF frequency.</p> <p>FIG. 2 shows an exemplary frequency spectrum 241 associated with the RF signal formed by the upconverter 240. The frequency spectrum 241 comprises a first portion 243 corresponding to the first signal component and a second portion 242 corresponding to the second signal component. Note that the first portion 243 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 242. Also note that the first portion 243 and</p>

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	<p>second portion 242 might be formed with a first mirror portion 244 and second mirror portion 245, respectively. Note that a mirror portion may either be removed or may be kept for later processing. The exemplary communication system 200 may further comprise a RF transmission stage 250 adapted to transmit an RF signal. The RF transmission stage 250 may, for example and without limitation, share any or all characteristics with the RF transmission stage 150 discussed previously. Such an RF signal may, for example, be associated with the composite signal output from the signal combiner 230 and upconverted by the upconverter 240. The RF transmission stage 250 may, for example and without limitation, comprise a power amplifier 252, antenna 254 and other components generally associated with RF signal transmission.</p> <p><i>See, e.g., Rofougaran at 6:66-7:57.</i></p> <p>For example, the spectral placement module 510, optional second spectral placement module 520 and signal combiner 530 may operate in the analog domain. The first digital-to-analog converter 592 may convert the first baseband signal to the analog domain for processing by the spectral placement module 510. The second digital-to-analog converter 594 may convert the second baseband signal to the analog domain for processing by the second spectral placement module 520 or signal combiner 530. The signal combiner 530 then combines signals in the analog domain to generate an analog composite signal, which is then upconverted and transmitted by the upconverter 540 and RF transmission stage 550, respectively.</p> <p><i>See, e.g., Rofougaran at 9:30-41.</i></p> <p>FIG. 7 is a diagram showing a portion of a seventh non-limiting exemplary communication system 700, in accordance with various aspects of the present invention. The exemplary communication system 700 may, for example and without limitation, share any or all characteristics with the exemplary systems 100-600 illustrated in FIGS. 1-6 and discussed previously.</p> <p>The exemplary communication system 700 may comprise a first mixer 744 that receives a spectrally shifted first baseband signal from the spectral placement module 710 and a first RF mixing signal (e.g., a 2.446 GHz signal generally associated with the Bluetooth communication protocol) from a</p>

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	<p>first local oscillator 742. The exemplary communication system 700 may also comprise a second mixer 748 that receives a second baseband signal (or a spectrally shifted second baseband signal) and a second RF mixing signal (e.g., a 2.486 GHz signal generally associated with the IEEE 802.11(g) communication protocol) from a second local oscillator 746.</p> <p>The exemplary communication system 700 may comprise an RF signal combiner 730 that is adapted to combine input RF signals. The RF signal combiner 730 may, for example, receive and combine the output signals from the first mixer 744 and second mixer 748 to generate an RF composite signal. The exemplary communication system 700 may also comprise a RF transmission stage 750 that receives the RF composite signal from the RF signal combiner 730 and transmit the signal.</p> <p><i>See, e.g., Rofougaran at 10:18-43.</i></p> <p>The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 810 comprises receiving the first baseband signal, step 810 may comprise receiving the first baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The first baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 810 may, for example, comprise generating the first baseband signal independently (e.g., corresponding to an independent communication). Step 810 may alternatively, for example, comprise generating the first baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first baseband signal and other baseband signals for a single communication).</p> <p>The exemplary method 800 may, at step 820, comprise spectrally placing (or shifting) the first baseband signal (e.g., received at step 810). Step 820 may, for example and without limitation, share any or all functional characteristics with the spectral placement modules 110-710 of the exemplary systems 100-700 illustrated in FIGS. 1-7 and discussed previously.</p>

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	<p>Step 820 may, for example, comprise spectrally shifting the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with a second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, step 820 may comprise implementing a frequency-hopping scheme with the first baseband signal. For example, in a scenario where there are one or more frequency bands (e.g., a second frequency space) associated with a second baseband signal, step 820 may comprise spectrally shifting the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p>In another non-limiting exemplary scenario, spectrally shifting the first baseband signal may result in the production of a spectral image (e.g., frequency content mirrored about a mixing frequency utilized to spectrally shift the first baseband signal). In such a scenario, step 820 may comprise accepting or rejecting the image.</p> <p>In a scenario where an image is rejected, step 820 may comprise rejecting the image in any of a variety of manners. For example and without limitation, step 820 may comprise performing image reject mixing to spectrally shift the first baseband signal. Such image reject mixing generally comprises spectrally shifting a signal and rejecting an image associated with the spectrally shifted signal. Also for example, step 820 may comprise filtering out an unwanted image. The scope of various aspects of the present invention should not be limited by the utilization of image rejection or by any particular manner of performing such image rejection.</p> <p>The exemplary method 800 may, at step 830, comprise generating and/or receiving a second baseband signal corresponding to a second communication protocol (e.g., different from the first communication protocol). Step 830 may, for example and without limitation, share any or all functional characteristics with the second input 102 of the exemplary system 100 illustrated in FIG. 1 and discussed previously.</p>

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	<p>The second baseband signal may, for example, correspond to a second communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 830 comprises receiving the second baseband signal, step 830 may comprise receiving the second baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 830 may, for example, comprise generating the second baseband signal independently (e.g., corresponding to a communication independent of a communication associated with the first baseband signal). Step 830 may alternatively, for example, comprise generating the second baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the second baseband signal and the first baseband signal for a single communication).</p> <p><i>See, e.g., Rofougaran at 11:53-13:4.</i></p> <p>Furthermore, this claim element is obvious in light of Rofougaran itself, when combined with any of the other references as charted for this claim element in Exs. A-1–A-31, First Supplemental Ex. A-Obviousness Chart, and/or when combined with the knowledge of one of ordinary skill in the art. Motivations to combine may come from the knowledge of the person of ordinary skill themselves, or from the known problems and predictable solutions as embodied in these references. Further motivations to combine references and additional details may be found in the Cover Pleading and First Supplemental Ex. A-Obviousness Chart.</p>
[17.4] a second digital-to-analog converter for receiving the second digital signal and converting the second digital signal into a second analog signal, the second analog signal carrying the second	Rofougaran discloses “a second digital-to-analog converter for receiving the second digital signal and converting the second digital signal into a second analog signal, the second analog signal carrying the second data across a second frequency range.” See, e.g.:

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<p>data across a second frequency range;</p>	<p>The diagram illustrates a signal processing system for spectral placement. It starts with two baseband signals: a First Baseband Signal (201) and a Second Baseband Signal (202). These signals are processed by a Spectral Placement Module (210), which generates three intermediate signals: 211, 212, and 213. Signal 211 is positioned at frequency $-f_s$, signal 212 is at f_s, and signal 213 is at $-f_s$. These three signals are combined at a Signal Combiner (230). The combined signal is then processed by a mixer (247), which includes a Local Oscillator (LO) (246) and a混频器 (248). The output of the mixer is a radio-frequency signal (RF) consisting of components 241, 242, 243, and 244. This RF signal is then amplified by a Power Amplifier (PA) (250) and transmitted through an antenna (252).</p>

Figure 2

See, e.g., Rofougaran at Figure 2.

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	<p>The diagram illustrates a signal processing chain for RF transmission. It begins with two baseband signals: the 1st Baseband Signal and the 2nd Baseband Signal. These signals are processed by two DACs (Digital-to-Analog Converters), labeled 592 and 594. The outputs of the DACs are fed into a Spectral Placement Module (510) and an optional second spectral placement module (520). The outputs from the modules are combined at a Signal Combiner (530). The combined signal then passes through an Upconverter (540) and an RF Xmit Stage (550) before being transmitted.</p>

Figure 5

See, e.g., Rofougaran at Figure 5.

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	<p>The diagram illustrates a communication system architecture. A 'First Baseband Signal' enters a 'Spectral Placement Module' (710). A 'Second Baseband Signal' enters an 'Optional Second Spectral Placement Module' (720). Both modules output signals to mixers. The mixer for the first module receives a local oscillator signal from 'LO1' (e.g., 2.446 GHz) and outputs to a 'RF Signal Combiner' (730). The mixer for the second module receives a local oscillator signal from 'LO2' (e.g., 2.486 GHz) and also outputs to the 'RF Signal Combiner'. The 'RF Signal Combiner' then feeds into an 'RF Xmit Stage' (750), which transmits the final signal.</p>

Figure 7

See, e.g., Rofougaran at Figure 7.

FIG. 1 is a diagram showing a portion of a first non-limiting exemplary communication system 100, in accordance with various aspects of the present invention. The communication system (or device) may comprise characteristics of any of a variety of communication systems/devices (e.g., multimode wireless communication devices). For example and without limitation, the communication system may comprise characteristics of any of a variety of mobile wireless communication devices (e.g.,

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	<p>cellular phones, paging devices, portable email devices, etc.). Also for example, the communication system may comprise characteristics of fixed communication systems or devices (e.g., network access points, base stations, satellites, wireless routers, set top boxes, etc.). Further for example, the communication system may comprise characteristics of a variety of electronic devices with wireless communication capability (e.g., televisions, music players, cameras, remote controls, personal digital assistants, handheld computers, gaming devices, etc.). Accordingly, the scope of various aspects of the present invention should not be limited by characteristics of particular communication systems or devices.</p> <p>The following discussion will, at times, refer to various communication modes. A multimode communication device may, for example, be adapted to communicate in a plurality of such communication modes. For the following discussion, a communication mode may generally be considered to coincide with communication utilizing a particular communication protocol or standard. A non-limiting list of exemplary communication protocols includes various cellular communication protocols (e.g., GSM, GPRS, EDGE, CDMA, WCDMA, TDMA, PDC, etc.), various wireless networking protocols or standards, including WLAN, WMAN, WPAN and WWAN (e.g., IEEE 802.11, Bluetooth, IEEE 802.15, UWB, IEEE 802.16, IEEE 802.20, Zigbee, any WiFi protocol, etc.), various television communication standards, etc. The scope of various aspects of the present invention should not be limited by characteristics of particular communication modes or protocols, whether standard or proprietary.</p> <p>The exemplary communication system 100 may comprise at least a first input 101 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to any of the previously mentioned communication protocols.</p> <p>The exemplary communication system 100 may also comprise at least a second input 102 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first</p>

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	<p>communication protocol discussed above). For example and without limitation, the second baseband signal may correspond to any of the previously mentioned communication protocols. The first baseband signal and the second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of the communication system 100. For example, such modules may generate the first and second baseband signals independently (e.g., corresponding to independent respective communications). Alternatively, for example, such modules may generate the first and second baseband signals in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first and second baseband signals for a single communication).</p> <p>The exemplary communication system 100 may additionally comprise a spectral placement module 110 that is adapted to spectrally shift the first baseband signal (i.e., shift the frequency spectrum of the first baseband signal). In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to spectrally shift the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with the second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to implement a frequency-hopping scheme with the first baseband signal. For example, in a scenario, where there are one or more frequency bands (e.g., a second frequency space) associated with the second baseband signal, the spectral placement module 110 may be adapted to shift the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p><i>See, e.g., Rofougaran at 2:38-3:58.</i></p> <p>The exemplary communication system 100 may also comprise a second spectral placement module 120. Such a second spectral placement module 120 may, for example, share any or all characteristics</p>

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	<p>with the spectral placement module 110 discussed previously. The incorporation of such a second spectral placement module 120 may, for example, provide spectral shifting flexibility. For example, in such an exemplary configuration, either or both of the first and second baseband signals may be spectrally shifted to substantially distinct frequency spaces. Also for example, in such an exemplary configuration, either or both of the first and second baseband signals may be frequency hopped. Note that though the second spectral placement module 120 is illustrated separate from the first spectral placement module 110, the second spectral placement module 120 may share any or all hardware and/or software components with the spectral placement module 110.</p> <p>The exemplary communication system 100 may further comprise a signal combiner 130 that is adapted to generate a composite signal comprising various input signals to the signal combiner 130. For example, the composite signal may simultaneously (i.e., at an instant in time) comprise components associated with various input signals. Note that such simultaneity need not always be present. For example, at a first instant in time, the signal output from the signal combiner 130 might comprise a plurality of components associated with a plurality of respective input signals, at a second instant in time, the signal output from the signal combiner 130 might comprise a single component associated with a single respective input signal, and at a third instant in time, the signal output from the signal combiner 130 might comprise no components.</p> <p>In a first non-limiting exemplary scenario, the signal combiner 130 may receive a first signal that is based on the first baseband signal (e.g., associated with a first communication protocol). Also, the signal combiner 130 may receive a second signal that is based on the second baseband signal (e.g., associated with a second communication protocol). In such a scenario, the signal combiner 130 may combine the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the first baseband signal and a second signal component based on the second baseband signal. In such a scenario, for example where the frequency spectra of the first and second baseband signals do not overlap, the first and second baseband signals might not be spectrally shifted prior to combining by the signal combiner 130. In such a scenario, the spectral placement module 110 (and optionally, the second spectral placement module 120) may receive a control signal indicating whether or not to perform spectral shifting and/or to what degree spectral shifting should be implemented.</p>

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	<p><i>See, e.g.</i>, Rofougaran at 4:16-67.</p> <p>Various components of the exemplary communication system 100 (and other communication systems illustrated and discussed herein) may be implemented in analog and/or digital circuitry. To illustrate this, the exemplary communication system 100 is not shown with analog-to-digital converters (ADCs) or digital-to-analog converters (DACs). FIGS. 4-6, to be discussed later, show various non-limiting exemplary configurations including such converters.</p> <p>FIG. 2 is a diagram showing a portion of a second non-limiting exemplary communication system 200, in accordance with various aspects of the present invention. The communication system 200 may, for example and without limitation, share any or all characteristics with the communication system 100 illustrated in FIG. 1 and discussed previously.</p> <p>The exemplary communication system 200 may comprise at least a first input 201 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to the Bluetooth communication protocol. FIG. 2 shows an exemplary frequency spectrum 203 associated with the first baseband signal.</p> <p>The exemplary communication system 200 may also comprise at least a second input 202 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first communication protocol discussed above). For example and without limitation, the first baseband signal may correspond to an IEEE 802.11 communication protocol (e.g., IEEE 802.11(b) or IEEE 802.11(g)). FIG. 2 shows an exemplary frequency spectrum 204 associated with the second baseband signal.</p> <p><i>See, e.g.</i>, Rofougaran at 5:64-6:31.</p>

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	<p>In a non-limiting exemplary configuration illustrated in FIG. 2, the signal combiner 230 receives a first signal from the spectral placement module 210 that is based on the spectrally shifted first baseband signal. Also, the signal combiner 230 receives a second signal that is based on the second baseband signal. In such a configuration, the signal combiner 230 combines the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the spectrally shifted first baseband signal and a second signal component based on the second baseband signal (e.g., not spectrally shifted).</p> <p>FIG. 2 shows an exemplary frequency spectrum 231 associated with the composite signal formed by the signal combiner 230. The spectrum 231 comprises a first portion 233 corresponding to the first signal component, and a second portion 232 corresponding to the second signal component. Note that the first portion 233 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 232.</p> <p>The exemplary communication system 200 may also comprise an upconverter 240 adapted to upconvert a signal (e.g., the composite signal from the signal combiner 230) for transmission. The upconverter 240 may, for example and without limitation, share any or all characteristics with the upconverter 140 discussed previously.</p> <p>The upconverter 240 may, for example, comprise a mixer 247, a local oscillator 246 and one or more filters 248. The mixer 247 may, for example, receive the composite signal from the signal combiner 230 and an RF mixing signal at frequency fRF from a local oscillator 246. The upconverter 240 may, for example, filter the upconverted signal from the mixer 247 with one or more filters 248. The output of the upconverter 240 may, for example, comprise a signal indicative of the composite signal spectrally shifted to an RF frequency.</p> <p>FIG. 2 shows an exemplary frequency spectrum 241 associated with the RF signal formed by the upconverter 240. The frequency spectrum 241 comprises a first portion 243 corresponding to the first signal component and a second portion 242 corresponding to the second signal component. Note that the first portion 243 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 242. Also note that the first portion 243 and</p>

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	<p>second portion 242 might be formed with a first mirror portion 244 and second mirror portion 245, respectively. Note that a mirror portion may either be removed or may be kept for later processing. The exemplary communication system 200 may further comprise a RF transmission stage 250 adapted to transmit an RF signal. The RF transmission stage 250 may, for example and without limitation, share any or all characteristics with the RF transmission stage 150 discussed previously. Such an RF signal may, for example, be associated with the composite signal output from the signal combiner 230 and upconverted by the upconverter 240. The RF transmission stage 250 may, for example and without limitation, comprise a power amplifier 252, antenna 254 and other components generally associated with RF signal transmission.</p> <p><i>See, e.g., Rofougaran at 6:66-7:57.</i></p> <p>For example, the spectral placement module 510, optional second spectral placement module 520 and signal combiner 530 may operate in the analog domain. The first digital-to-analog converter 592 may convert the first baseband signal to the analog domain for processing by the spectral placement module 510. The second digital-to-analog converter 594 may convert the second baseband signal to the analog domain for processing by the second spectral placement module 520 or signal combiner 530. The signal combiner 530 then combines signals in the analog domain to generate an analog composite signal, which is then upconverted and transmitted by the upconverter 540 and RF transmission stage 550, respectively.</p> <p><i>See, e.g., Rofougaran at 9:30-41.</i></p> <p>FIG. 7 is a diagram showing a portion of a seventh non-limiting exemplary communication system 700, in accordance with various aspects of the present invention. The exemplary communication system 700 may, for example and without limitation, share any or all characteristics with the exemplary systems 100-600 illustrated in FIGS. 1-6 and discussed previously.</p> <p>The exemplary communication system 700 may comprise a first mixer 744 that receives a spectrally shifted first baseband signal from the spectral placement module 710 and a first RF mixing signal (e.g., a 2.446 GHz signal generally associated with the Bluetooth communication protocol) from a</p>

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	<p>first local oscillator 742. The exemplary communication system 700 may also comprise a second mixer 748 that receives a second baseband signal (or a spectrally shifted second baseband signal) and a second RF mixing signal (e.g., a 2.486 GHz signal generally associated with the IEEE 802.11(g) communication protocol) from a second local oscillator 746.</p> <p>The exemplary communication system 700 may comprise an RF signal combiner 730 that is adapted to combine input RF signals. The RF signal combiner 730 may, for example, receive and combine the output signals from the first mixer 744 and second mixer 748 to generate an RF composite signal. The exemplary communication system 700 may also comprise a RF transmission stage 750 that receives the RF composite signal from the RF signal combiner 730 and transmit the signal.</p> <p><i>See, e.g.</i>, Rofougaran at 10:18-43.</p> <p>The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 810 comprises receiving the first baseband signal, step 810 may comprise receiving the first baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The first baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 810 may, for example, comprise generating the first baseband signal independently (e.g., corresponding to an independent communication). Step 810 may alternatively, for example, comprise generating the first baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first baseband signal and other baseband signals for a single communication).</p> <p>The exemplary method 800 may, at step 820, comprise spectrally placing (or shifting) the first baseband signal (e.g., received at step 810). Step 820 may, for example and without limitation, share any or all functional characteristics with the spectral placement modules 110-710 of the exemplary systems 100-700 illustrated in FIGS. 1-7 and discussed previously.</p>

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	<p>Step 820 may, for example, comprise spectrally shifting the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with a second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, step 820 may comprise implementing a frequency-hopping scheme with the first baseband signal. For example, in a scenario where there are one or more frequency bands (e.g., a second frequency space) associated with a second baseband signal, step 820 may comprise spectrally shifting the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p>In another non-limiting exemplary scenario, spectrally shifting the first baseband signal may result in the production of a spectral image (e.g., frequency content mirrored about a mixing frequency utilized to spectrally shift the first baseband signal). In such a scenario, step 820 may comprise accepting or rejecting the image.</p> <p>In a scenario where an image is rejected, step 820 may comprise rejecting the image in any of a variety of manners. For example and without limitation, step 820 may comprise performing image reject mixing to spectrally shift the first baseband signal. Such image reject mixing generally comprises spectrally shifting a signal and rejecting an image associated with the spectrally shifted signal. Also for example, step 820 may comprise filtering out an unwanted image. The scope of various aspects of the present invention should not be limited by the utilization of image rejection or by any particular manner of performing such image rejection.</p> <p>The exemplary method 800 may, at step 830, comprise generating and/or receiving a second baseband signal corresponding to a second communication protocol (e.g., different from the first communication protocol). Step 830 may, for example and without limitation, share any or all functional characteristics with the second input 102 of the exemplary system 100 illustrated in FIG. 1 and discussed previously.</p>

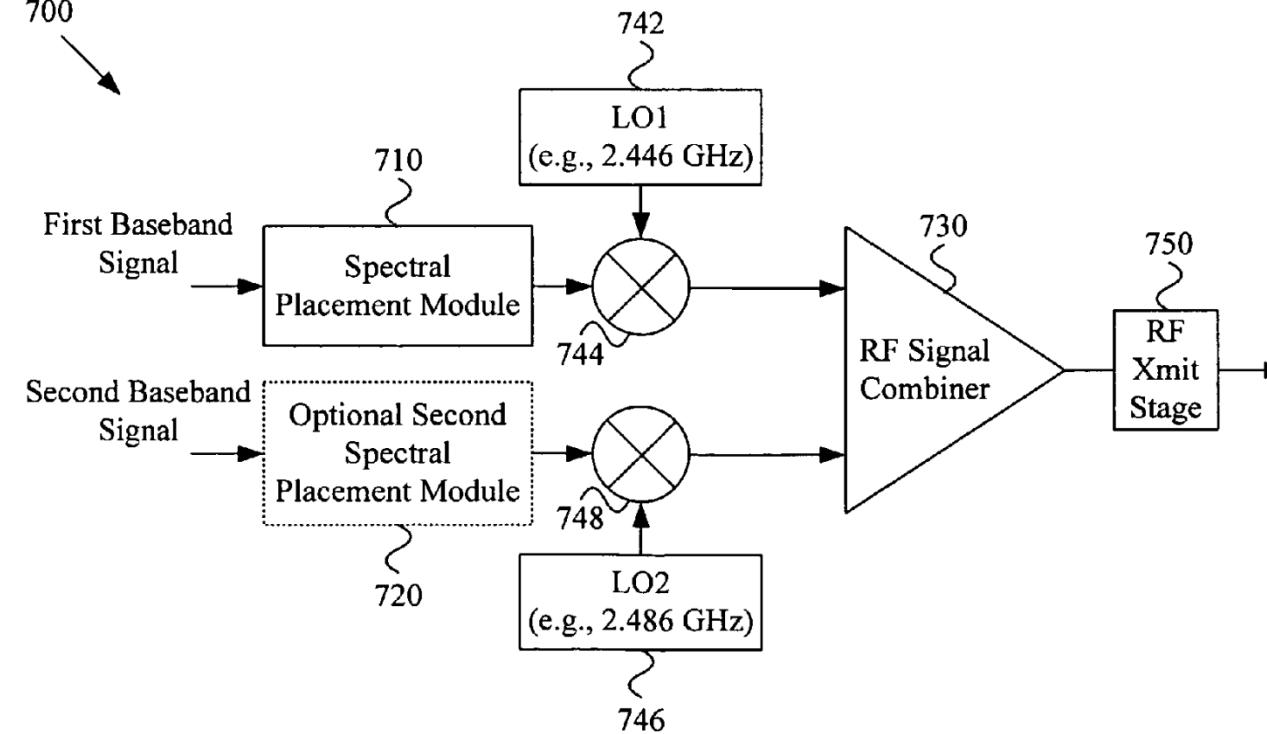
Claim 17 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>The second baseband signal may, for example, correspond to a second communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 830 comprises receiving the second baseband signal, step 830 may comprise receiving the second baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 830 may, for example, comprise generating the second baseband signal independently (e.g., corresponding to a communication independent of a communication associated with the first baseband signal). Step 830 may alternatively, for example, comprise generating the second baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the second baseband signal and the first baseband signal for a single communication).</p> <p><i>See, e.g., Rofougaran at 11:53-13:4.</i></p> <p>Furthermore, this claim element is obvious in light of Rofougaran itself, when combined with any of the other references as charted for this claim element in Exs. A-1–A-31, First Supplemental Ex. A–Obviousness Chart, and/or when combined with the knowledge of one of ordinary skill in the art. Motivations to combine may come from the knowledge of the person of ordinary skill themselves, or from the known problems and predictable solutions as embodied in these references. Further motivations to combine references and additional details may be found in the Cover Pleading and First Supplemental Ex. A–Obviousness Chart.</p>
[17.5] a first up-converter circuit having a first input coupled to receive the first analog signal and a second input coupled to receive a first modulation signal having a first RF frequency, wherein the first up-converter outputs	Rofougaran discloses “a first up-converter circuit having a first input coupled to receive the first analog signal and a second input coupled to receive a first modulation signal having a first RF frequency, wherein the first up-converter outputs a first up-converted analog signal comprising a first up-converted frequency range from the first RF frequency minus one-half the first frequency range to the first RF frequency plus one-half the first frequency range.” See, e.g.:

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<p>a first up-converted analog signal comprising a first up-converted frequency range from the first RF frequency minus one-half the first frequency range to the first RF frequency plus one-half the first frequency range;</p>	<p>The diagram illustrates a transmission system architecture. It starts with two baseband signals, labeled 'First Baseband Signal' (201) and 'Second Baseband Signal' (202), which enter a 'Spectral Placement Module' (210). This module outputs signals 211 and 212, which are positioned symmetrically around a carrier frequency f_s. These signals are combined at a 'Signal Combiner' (230). The combined signal 247 is fed into a 'LO' (Local Oscillator) module (246) and a 'PA' (Power Amplifier) module (250). The LO module also receives a signal 248. The PA module contains a power amplifier (254) and a duplexer (252). Frequency axes at the bottom show the placement of signals relative to the RF center frequency f_{RF}.</p> <p>See, e.g., Rofougaran at Figure 2.</p>

Claim 17 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>The diagram illustrates a signal processing chain for RF transmission. It begins with two baseband signals: the 1st Baseband Signal and the 2nd Baseband Signal. These signals are processed by two DACs (Digital-to-Analog Converters), labeled 592 and 594. The outputs of the DACs are fed into a Spectral Placement Module (510) and an optional second spectral placement module (520). The outputs from the modules are combined at a Signal Combiner (530). The combined signal then passes through an Upconverter (540) and an RF Xmit Stage (550) before being transmitted.</p>

Figure 5

See, e.g., Rofougaran at Figure 5.

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	 <p>The diagram illustrates a communication system architecture. It starts with two baseband signal inputs: a "First Baseband Signal" and a "Second Baseband Signal". The First Baseband Signal is processed by a "Spectral Placement Module" (710). This module is connected to a mixer (744), which also receives a local oscillator signal from "LO1" (e.g., 2.446 GHz). The output of the mixer is then sent to an "RF Signal Combiner" (730). The Second Baseband Signal is processed by an "Optional Second Spectral Placement Module" (720). This module is connected to another mixer (748), which receives a local oscillator signal from "LO2" (e.g., 2.486 GHz). The output of this second mixer is also sent to the "RF Signal Combiner" (730). Finally, the combined signal from the "RF Signal Combiner" passes through an "RF Xmit Stage" (750) for transmission.</p> <p>Figure 7</p> <p><i>See, e.g., Rofougaran at Figure 7.</i></p> <p>FIG. 1 is a diagram showing a portion of a first non-limiting exemplary communication system 100, in accordance with various aspects of the present invention. The communication system (or device) may comprise characteristics of any of a variety of communication systems/devices (e.g., multimode wireless communication devices). For example and without limitation, the communication system may comprise characteristics of any of a variety of mobile wireless communication devices (e.g.,</p>

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	<p>cellular phones, paging devices, portable email devices, etc.). Also for example, the communication system may comprise characteristics of fixed communication systems or devices (e.g., network access points, base stations, satellites, wireless routers, set top boxes, etc.). Further for example, the communication system may comprise characteristics of a variety of electronic devices with wireless communication capability (e.g., televisions, music players, cameras, remote controls, personal digital assistants, handheld computers, gaming devices, etc.). Accordingly, the scope of various aspects of the present invention should not be limited by characteristics of particular communication systems or devices.</p> <p>The following discussion will, at times, refer to various communication modes. A multimode communication device may, for example, be adapted to communicate in a plurality of such communication modes. For the following discussion, a communication mode may generally be considered to coincide with communication utilizing a particular communication protocol or standard. A non-limiting list of exemplary communication protocols includes various cellular communication protocols (e.g., GSM, GPRS, EDGE, CDMA, WCDMA, TDMA, PDC, etc.), various wireless networking protocols or standards, including WLAN, WMAN, WPAN and WWAN (e.g., IEEE 802.11, Bluetooth, IEEE 802.15, UWB, IEEE 802.16, IEEE 802.20, Zigbee, any WiFi protocol, etc.), various television communication standards, etc. The scope of various aspects of the present invention should not be limited by characteristics of particular communication modes or protocols, whether standard or proprietary.</p> <p>The exemplary communication system 100 may comprise at least a first input 101 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to any of the previously mentioned communication protocols.</p> <p>The exemplary communication system 100 may also comprise at least a second input 102 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first</p>

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	<p>communication protocol discussed above). For example and without limitation, the second baseband signal may correspond to any of the previously mentioned communication protocols. The first baseband signal and the second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of the communication system 100. For example, such modules may generate the first and second baseband signals independently (e.g., corresponding to independent respective communications). Alternatively, for example, such modules may generate the first and second baseband signals in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first and second baseband signals for a single communication).</p> <p>The exemplary communication system 100 may additionally comprise a spectral placement module 110 that is adapted to spectrally shift the first baseband signal (i.e., shift the frequency spectrum of the first baseband signal). In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to spectrally shift the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with the second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to implement a frequency-hopping scheme with the first baseband signal. For example, in a scenario, where there are one or more frequency bands (e.g., a second frequency space) associated with the second baseband signal, the spectral placement module 110 may be adapted to shift the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p><i>See, e.g., Rofougaran at 2:38-3:58.</i></p> <p>The exemplary communication system 100 may also comprise a second spectral placement module 120. Such a second spectral placement module 120 may, for example, share any or all characteristics</p>

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	<p>with the spectral placement module 110 discussed previously. The incorporation of such a second spectral placement module 120 may, for example, provide spectral shifting flexibility. For example, in such an exemplary configuration, either or both of the first and second baseband signals may be spectrally shifted to substantially distinct frequency spaces. Also for example, in such an exemplary configuration, either or both of the first and second baseband signals may be frequency hopped. Note that though the second spectral placement module 120 is illustrated separate from the first spectral placement module 110, the second spectral placement module 120 may share any or all hardware and/or software components with the spectral placement module 110.</p> <p>The exemplary communication system 100 may further comprise a signal combiner 130 that is adapted to generate a composite signal comprising various input signals to the signal combiner 130. For example, the composite signal may simultaneously (i.e., at an instant in time) comprise components associated with various input signals. Note that such simultaneity need not always be present. For example, at a first instant in time, the signal output from the signal combiner 130 might comprise a plurality of components associated with a plurality of respective input signals, at a second instant in time, the signal output from the signal combiner 130 might comprise a single component associated with a single respective input signal, and at a third instant in time, the signal output from the signal combiner 130 might comprise no components.</p> <p>In a first non-limiting exemplary scenario, the signal combiner 130 may receive a first signal that is based on the first baseband signal (e.g., associated with a first communication protocol). Also, the signal combiner 130 may receive a second signal that is based on the second baseband signal (e.g., associated with a second communication protocol). In such a scenario, the signal combiner 130 may combine the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the first baseband signal and a second signal component based on the second baseband signal. In such a scenario, for example where the frequency spectra of the first and second baseband signals do not overlap, the first and second baseband signals might not be spectrally shifted prior to combining by the signal combiner 130. In such a scenario, the spectral placement module 110 (and optionally, the second spectral placement module 120) may receive a control signal indicating whether or not to perform spectral shifting and/or to what degree spectral shifting should be implemented.</p>

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	<p><i>See, e.g.</i>, Rofougaran at 4:16-67.</p> <p>Various components of the exemplary communication system 100 (and other communication systems illustrated and discussed herein) may be implemented in analog and/or digital circuitry. To illustrate this, the exemplary communication system 100 is not shown with analog-to-digital converters (ADCs) or digital-to-analog converters (DACs). FIGS. 4-6, to be discussed later, show various non-limiting exemplary configurations including such converters.</p> <p>FIG. 2 is a diagram showing a portion of a second non-limiting exemplary communication system 200, in accordance with various aspects of the present invention. The communication system 200 may, for example and without limitation, share any or all characteristics with the communication system 100 illustrated in FIG. 1 and discussed previously.</p> <p>The exemplary communication system 200 may comprise at least a first input 201 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to the Bluetooth communication protocol. FIG. 2 shows an exemplary frequency spectrum 203 associated with the first baseband signal.</p> <p>The exemplary communication system 200 may also comprise at least a second input 202 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first communication protocol discussed above). For example and without limitation, the first baseband signal may correspond to an IEEE 802.11 communication protocol (e.g., IEEE 802.11(b) or IEEE 802.11(g)). FIG. 2 shows an exemplary frequency spectrum 204 associated with the second baseband signal.</p> <p><i>See, e.g.</i>, Rofougaran at 5:64-6:31.</p>

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	<p>In a non-limiting exemplary configuration illustrated in FIG. 2, the signal combiner 230 receives a first signal from the spectral placement module 210 that is based on the spectrally shifted first baseband signal. Also, the signal combiner 230 receives a second signal that is based on the second baseband signal. In such a configuration, the signal combiner 230 combines the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the spectrally shifted first baseband signal and a second signal component based on the second baseband signal (e.g., not spectrally shifted).</p> <p>FIG. 2 shows an exemplary frequency spectrum 231 associated with the composite signal formed by the signal combiner 230. The spectrum 231 comprises a first portion 233 corresponding to the first signal component, and a second portion 232 corresponding to the second signal component. Note that the first portion 233 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 232.</p> <p>The exemplary communication system 200 may also comprise an upconverter 240 adapted to upconvert a signal (e.g., the composite signal from the signal combiner 230) for transmission. The upconverter 240 may, for example and without limitation, share any or all characteristics with the upconverter 140 discussed previously.</p> <p>The upconverter 240 may, for example, comprise a mixer 247, a local oscillator 246 and one or more filters 248. The mixer 247 may, for example, receive the composite signal from the signal combiner 230 and an RF mixing signal at frequency fRF from a local oscillator 246. The upconverter 240 may, for example, filter the upconverted signal from the mixer 247 with one or more filters 248. The output of the upconverter 240 may, for example, comprise a signal indicative of the composite signal spectrally shifted to an RF frequency.</p> <p>FIG. 2 shows an exemplary frequency spectrum 241 associated with the RF signal formed by the upconverter 240. The frequency spectrum 241 comprises a first portion 243 corresponding to the first signal component and a second portion 242 corresponding to the second signal component. Note that the first portion 243 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 242. Also note that the first portion 243 and</p>

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	<p>second portion 242 might be formed with a first mirror portion 244 and second mirror portion 245, respectively. Note that a mirror portion may either be removed or may be kept for later processing. The exemplary communication system 200 may further comprise a RF transmission stage 250 adapted to transmit an RF signal. The RF transmission stage 250 may, for example and without limitation, share any or all characteristics with the RF transmission stage 150 discussed previously. Such an RF signal may, for example, be associated with the composite signal output from the signal combiner 230 and upconverted by the upconverter 240. The RF transmission stage 250 may, for example and without limitation, comprise a power amplifier 252, antenna 254 and other components generally associated with RF signal transmission.</p> <p><i>See, e.g., Rofougaran at 6:66-7:57.</i></p> <p>For example, the spectral placement module 510, optional second spectral placement module 520 and signal combiner 530 may operate in the analog domain. The first digital-to-analog converter 592 may convert the first baseband signal to the analog domain for processing by the spectral placement module 510. The second digital-to-analog converter 594 may convert the second baseband signal to the analog domain for processing by the second spectral placement module 520 or signal combiner 530. The signal combiner 530 then combines signals in the analog domain to generate an analog composite signal, which is then upconverted and transmitted by the upconverter 540 and RF transmission stage 550, respectively.</p> <p><i>See, e.g., Rofougaran at 9:30-41.</i></p> <p>FIG. 7 is a diagram showing a portion of a seventh non-limiting exemplary communication system 700, in accordance with various aspects of the present invention. The exemplary communication system 700 may, for example and without limitation, share any or all characteristics with the exemplary systems 100-600 illustrated in FIGS. 1-6 and discussed previously.</p> <p>The exemplary communication system 700 may comprise a first mixer 744 that receives a spectrally shifted first baseband signal from the spectral placement module 710 and a first RF mixing signal (e.g., a 2.446 GHz signal generally associated with the Bluetooth communication protocol) from a</p>

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	<p>first local oscillator 742. The exemplary communication system 700 may also comprise a second mixer 748 that receives a second baseband signal (or a spectrally shifted second baseband signal) and a second RF mixing signal (e.g., a 2.486 GHz signal generally associated with the IEEE 802.11(g) communication protocol) from a second local oscillator 746.</p> <p>The exemplary communication system 700 may comprise an RF signal combiner 730 that is adapted to combine input RF signals. The RF signal combiner 730 may, for example, receive and combine the output signals from the first mixer 744 and second mixer 748 to generate an RF composite signal. The exemplary communication system 700 may also comprise a RF transmission stage 750 that receives the RF composite signal from the RF signal combiner 730 and transmit the signal.</p> <p><i>See, e.g., Rofougaran at 10:18-43.</i></p> <p>The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 810 comprises receiving the first baseband signal, step 810 may comprise receiving the first baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The first baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 810 may, for example, comprise generating the first baseband signal independently (e.g., corresponding to an independent communication). Step 810 may alternatively, for example, comprise generating the first baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first baseband signal and other baseband signals for a single communication).</p> <p>The exemplary method 800 may, at step 820, comprise spectrally placing (or shifting) the first baseband signal (e.g., received at step 810). Step 820 may, for example and without limitation, share any or all functional characteristics with the spectral placement modules 110-710 of the exemplary systems 100-700 illustrated in FIGS. 1-7 and discussed previously.</p>

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	<p>Step 820 may, for example, comprise spectrally shifting the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with a second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, step 820 may comprise implementing a frequency-hopping scheme with the first baseband signal. For example, in a scenario where there are one or more frequency bands (e.g., a second frequency space) associated with a second baseband signal, step 820 may comprise spectrally shifting the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p>In another non-limiting exemplary scenario, spectrally shifting the first baseband signal may result in the production of a spectral image (e.g., frequency content mirrored about a mixing frequency utilized to spectrally shift the first baseband signal). In such a scenario, step 820 may comprise accepting or rejecting the image.</p> <p>In a scenario where an image is rejected, step 820 may comprise rejecting the image in any of a variety of manners. For example and without limitation, step 820 may comprise performing image reject mixing to spectrally shift the first baseband signal. Such image reject mixing generally comprises spectrally shifting a signal and rejecting an image associated with the spectrally shifted signal. Also for example, step 820 may comprise filtering out an unwanted image. The scope of various aspects of the present invention should not be limited by the utilization of image rejection or by any particular manner of performing such image rejection.</p> <p>The exemplary method 800 may, at step 830, comprise generating and/or receiving a second baseband signal corresponding to a second communication protocol (e.g., different from the first communication protocol). Step 830 may, for example and without limitation, share any or all functional characteristics with the second input 102 of the exemplary system 100 illustrated in FIG. 1 and discussed previously.</p>

Claim 17 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>The second baseband signal may, for example, correspond to a second communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 830 comprises receiving the second baseband signal, step 830 may comprise receiving the second baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 830 may, for example, comprise generating the second baseband signal independently (e.g., corresponding to a communication independent of a communication associated with the first baseband signal). Step 830 may alternatively, for example, comprise generating the second baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the second baseband signal and the first baseband signal for a single communication).</p> <p><i>See, e.g., Rofougaran at 11:53-13:4.</i></p> <p>Furthermore, this claim element is obvious in light of Rofougaran itself, when combined with any of the other references as charted for this claim element in Exs. A-1–A-31, First Supplemental Ex. A-Obviousness Chart, and/or when combined with the knowledge of one of ordinary skill in the art. Motivations to combine may come from the knowledge of the person of ordinary skill themselves, or from the known problems and predictable solutions as embodied in these references. Further motivations to combine references and additional details may be found in the Cover Pleading and First Supplemental Ex. A-Obviousness Chart.</p>
[17.6] a second up-converter circuit having a first input coupled to receive the second analog signal and a second input coupled to receive a second modulation signal having a second RF frequency, wherein the second up-converter outputs a second up-converted analog signal comprising a second up-converted frequency range from the second RF frequency minus one-half the second frequency range to the second RF frequency plus one-half the second frequency range, and wherein frequency difference between the first RF frequency and the second RF frequency is greater than the sum of one-half the first frequency range and one-half the second frequency range	Rofougaran discloses “a second up-converter circuit having a first input coupled to receive the second analog signal and a second input coupled to receive a second modulation signal having a second RF frequency, wherein the second up-converter outputs a second up-converted analog signal comprising a second up-converted frequency range from the second RF frequency minus one-half the second frequency range to the second RF frequency plus one-half the second frequency range, and wherein frequency difference between the first RF frequency and the second RF frequency is greater than the sum of one-half the first frequency range and one-half the second frequency range.” See, e.g.:

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<p>up-converter outputs a second up-converted analog signal comprising a second up-converted frequency range from the second RF frequency minus one-half the second frequency range to the second RF frequency plus one-half the second frequency range, and wherein frequency difference between the first RF frequency and the second RF frequency is greater than the sum of one-half the first frequency range and one-half the second frequency range; and</p>	<p>Figure 2 illustrates the architecture of the spectral placement module. It takes two baseband signals, the First Baseband Signal (201) and the Second Baseband Signal (202), which are processed by a Spectral Placement Module (210). The module generates two signals, 211 and 212, which are then combined at a Signal Combiner (230). A Local Oscillator (LO) signal (246) is also fed into the combiner. The resulting signal 240 is then processed through a mixer (247) and a Power Amplifier (PA) (250) to produce the final output signal 250. The diagram also shows frequency markers: $-f_s$, f_s, $-f_{RF}$, and f_{RF}.</p> <p>See, e.g., Rofougaran at Figure 2.</p>

Claim 17 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>The diagram illustrates a signal processing chain for RF transmission. It begins with two baseband signals: the 1st Baseband Signal and the 2nd Baseband Signal. These signals are processed by two DACs (Digital-to-Analog Converters), labeled 592 and 594. The outputs of the DACs are fed into a Spectral Placement Module (510) and an optional second spectral placement module (520). The outputs from the modules are combined at a Signal Combiner (530). The combined signal then passes through an Upconverter (540) and an RF Xmit Stage (550) before being transmitted.</p>

Figure 5

See, e.g., Rofougaran at Figure 5.

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	<p>Figure 7</p> <p>See, e.g., Rofougaran at Figure 7.</p> <p>FIG. 1 is a diagram showing a portion of a first non-limiting exemplary communication system 100, in accordance with various aspects of the present invention. The communication system (or device) may comprise characteristics of any of a variety of communication systems/devices (e.g., multimode wireless communication devices). For example and without limitation, the communication system may comprise characteristics of any of a variety of mobile wireless communication devices (e.g.,</p>

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	<p>cellular phones, paging devices, portable email devices, etc.). Also for example, the communication system may comprise characteristics of fixed communication systems or devices (e.g., network access points, base stations, satellites, wireless routers, set top boxes, etc.). Further for example, the communication system may comprise characteristics of a variety of electronic devices with wireless communication capability (e.g., televisions, music players, cameras, remote controls, personal digital assistants, handheld computers, gaming devices, etc.). Accordingly, the scope of various aspects of the present invention should not be limited by characteristics of particular communication systems or devices.</p> <p>The following discussion will, at times, refer to various communication modes. A multimode communication device may, for example, be adapted to communicate in a plurality of such communication modes. For the following discussion, a communication mode may generally be considered to coincide with communication utilizing a particular communication protocol or standard. A non-limiting list of exemplary communication protocols includes various cellular communication protocols (e.g., GSM, GPRS, EDGE, CDMA, WCDMA, TDMA, PDC, etc.), various wireless networking protocols or standards, including WLAN, WMAN, WPAN and WWAN (e.g., IEEE 802.11, Bluetooth, IEEE 802.15, UWB, IEEE 802.16, IEEE 802.20, Zigbee, any WiFi protocol, etc.), various television communication standards, etc. The scope of various aspects of the present invention should not be limited by characteristics of particular communication modes or protocols, whether standard or proprietary.</p> <p>The exemplary communication system 100 may comprise at least a first input 101 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to any of the previously mentioned communication protocols.</p> <p>The exemplary communication system 100 may also comprise at least a second input 102 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first</p>

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	<p>communication protocol discussed above). For example and without limitation, the second baseband signal may correspond to any of the previously mentioned communication protocols. The first baseband signal and the second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of the communication system 100. For example, such modules may generate the first and second baseband signals independently (e.g., corresponding to independent respective communications). Alternatively, for example, such modules may generate the first and second baseband signals in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first and second baseband signals for a single communication).</p> <p>The exemplary communication system 100 may additionally comprise a spectral placement module 110 that is adapted to spectrally shift the first baseband signal (i.e., shift the frequency spectrum of the first baseband signal). In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to spectrally shift the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with the second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to implement a frequency-hopping scheme with the first baseband signal. For example, in a scenario, where there are one or more frequency bands (e.g., a second frequency space) associated with the second baseband signal, the spectral placement module 110 may be adapted to shift the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p><i>See, e.g., Rofougaran at 2:38-3:58.</i></p> <p>The exemplary communication system 100 may also comprise a second spectral placement module 120. Such a second spectral placement module 120 may, for example, share any or all characteristics</p>

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	<p>with the spectral placement module 110 discussed previously. The incorporation of such a second spectral placement module 120 may, for example, provide spectral shifting flexibility. For example, in such an exemplary configuration, either or both of the first and second baseband signals may be spectrally shifted to substantially distinct frequency spaces. Also for example, in such an exemplary configuration, either or both of the first and second baseband signals may be frequency hopped. Note that though the second spectral placement module 120 is illustrated separate from the first spectral placement module 110, the second spectral placement module 120 may share any or all hardware and/or software components with the spectral placement module 110.</p> <p>The exemplary communication system 100 may further comprise a signal combiner 130 that is adapted to generate a composite signal comprising various input signals to the signal combiner 130. For example, the composite signal may simultaneously (i.e., at an instant in time) comprise components associated with various input signals. Note that such simultaneity need not always be present. For example, at a first instant in time, the signal output from the signal combiner 130 might comprise a plurality of components associated with a plurality of respective input signals, at a second instant in time, the signal output from the signal combiner 130 might comprise a single component associated with a single respective input signal, and at a third instant in time, the signal output from the signal combiner 130 might comprise no components.</p> <p>In a first non-limiting exemplary scenario, the signal combiner 130 may receive a first signal that is based on the first baseband signal (e.g., associated with a first communication protocol). Also, the signal combiner 130 may receive a second signal that is based on the second baseband signal (e.g., associated with a second communication protocol). In such a scenario, the signal combiner 130 may combine the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the first baseband signal and a second signal component based on the second baseband signal. In such a scenario, for example where the frequency spectra of the first and second baseband signals do not overlap, the first and second baseband signals might not be spectrally shifted prior to combining by the signal combiner 130. In such a scenario, the spectral placement module 110 (and optionally, the second spectral placement module 120) may receive a control signal indicating whether or not to perform spectral shifting and/or to what degree spectral shifting should be implemented.</p>

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	<p><i>See, e.g.</i>, Rofougaran at 4:16-67.</p> <p>Various components of the exemplary communication system 100 (and other communication systems illustrated and discussed herein) may be implemented in analog and/or digital circuitry. To illustrate this, the exemplary communication system 100 is not shown with analog-to-digital converters (ADCs) or digital-to-analog converters (DACs). FIGS. 4-6, to be discussed later, show various non-limiting exemplary configurations including such converters.</p> <p>FIG. 2 is a diagram showing a portion of a second non-limiting exemplary communication system 200, in accordance with various aspects of the present invention. The communication system 200 may, for example and without limitation, share any or all characteristics with the communication system 100 illustrated in FIG. 1 and discussed previously.</p> <p>The exemplary communication system 200 may comprise at least a first input 201 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to the Bluetooth communication protocol. FIG. 2 shows an exemplary frequency spectrum 203 associated with the first baseband signal.</p> <p>The exemplary communication system 200 may also comprise at least a second input 202 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first communication protocol discussed above). For example and without limitation, the first baseband signal may correspond to an IEEE 802.11 communication protocol (e.g., IEEE 802.11(b) or IEEE 802.11(g)). FIG. 2 shows an exemplary frequency spectrum 204 associated with the second baseband signal.</p> <p><i>See, e.g.</i>, Rofougaran at 5:64-6:31.</p>

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	<p>In a non-limiting exemplary configuration illustrated in FIG. 2, the signal combiner 230 receives a first signal from the spectral placement module 210 that is based on the spectrally shifted first baseband signal. Also, the signal combiner 230 receives a second signal that is based on the second baseband signal. In such a configuration, the signal combiner 230 combines the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the spectrally shifted first baseband signal and a second signal component based on the second baseband signal (e.g., not spectrally shifted).</p> <p>FIG. 2 shows an exemplary frequency spectrum 231 associated with the composite signal formed by the signal combiner 230. The spectrum 231 comprises a first portion 233 corresponding to the first signal component, and a second portion 232 corresponding to the second signal component. Note that the first portion 233 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 232.</p> <p>The exemplary communication system 200 may also comprise an upconverter 240 adapted to upconvert a signal (e.g., the composite signal from the signal combiner 230) for transmission. The upconverter 240 may, for example and without limitation, share any or all characteristics with the upconverter 140 discussed previously.</p> <p>The upconverter 240 may, for example, comprise a mixer 247, a local oscillator 246 and one or more filters 248. The mixer 247 may, for example, receive the composite signal from the signal combiner 230 and an RF mixing signal at frequency fRF from a local oscillator 246. The upconverter 240 may, for example, filter the upconverted signal from the mixer 247 with one or more filters 248. The output of the upconverter 240 may, for example, comprise a signal indicative of the composite signal spectrally shifted to an RF frequency.</p> <p>FIG. 2 shows an exemplary frequency spectrum 241 associated with the RF signal formed by the upconverter 240. The frequency spectrum 241 comprises a first portion 243 corresponding to the first signal component and a second portion 242 corresponding to the second signal component. Note that the first portion 243 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 242. Also note that the first portion 243 and</p>

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	<p>second portion 242 might be formed with a first mirror portion 244 and second mirror portion 245, respectively. Note that a mirror portion may either be removed or may be kept for later processing. The exemplary communication system 200 may further comprise a RF transmission stage 250 adapted to transmit an RF signal. The RF transmission stage 250 may, for example and without limitation, share any or all characteristics with the RF transmission stage 150 discussed previously. Such an RF signal may, for example, be associated with the composite signal output from the signal combiner 230 and upconverted by the upconverter 240. The RF transmission stage 250 may, for example and without limitation, comprise a power amplifier 252, antenna 254 and other components generally associated with RF signal transmission.</p> <p><i>See, e.g., Rofougaran at 6:66-7:57.</i></p> <p>For example, the spectral placement module 510, optional second spectral placement module 520 and signal combiner 530 may operate in the analog domain. The first digital-to-analog converter 592 may convert the first baseband signal to the analog domain for processing by the spectral placement module 510. The second digital-to-analog converter 594 may convert the second baseband signal to the analog domain for processing by the second spectral placement module 520 or signal combiner 530. The signal combiner 530 then combines signals in the analog domain to generate an analog composite signal, which is then upconverted and transmitted by the upconverter 540 and RF transmission stage 550, respectively.</p> <p><i>See, e.g., Rofougaran at 9:30-41.</i></p> <p>FIG. 7 is a diagram showing a portion of a seventh non-limiting exemplary communication system 700, in accordance with various aspects of the present invention. The exemplary communication system 700 may, for example and without limitation, share any or all characteristics with the exemplary systems 100-600 illustrated in FIGS. 1-6 and discussed previously.</p> <p>The exemplary communication system 700 may comprise a first mixer 744 that receives a spectrally shifted first baseband signal from the spectral placement module 710 and a first RF mixing signal (e.g., a 2.446 GHz signal generally associated with the Bluetooth communication protocol) from a</p>

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	<p>first local oscillator 742. The exemplary communication system 700 may also comprise a second mixer 748 that receives a second baseband signal (or a spectrally shifted second baseband signal) and a second RF mixing signal (e.g., a 2.486 GHz signal generally associated with the IEEE 802.11(g) communication protocol) from a second local oscillator 746.</p> <p>The exemplary communication system 700 may comprise an RF signal combiner 730 that is adapted to combine input RF signals. The RF signal combiner 730 may, for example, receive and combine the output signals from the first mixer 744 and second mixer 748 to generate an RF composite signal. The exemplary communication system 700 may also comprise a RF transmission stage 750 that receives the RF composite signal from the RF signal combiner 730 and transmit the signal.</p> <p><i>See, e.g., Rofougaran at 10:18-43.</i></p> <p>The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 810 comprises receiving the first baseband signal, step 810 may comprise receiving the first baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The first baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 810 may, for example, comprise generating the first baseband signal independently (e.g., corresponding to an independent communication). Step 810 may alternatively, for example, comprise generating the first baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first baseband signal and other baseband signals for a single communication).</p> <p>The exemplary method 800 may, at step 820, comprise spectrally placing (or shifting) the first baseband signal (e.g., received at step 810). Step 820 may, for example and without limitation, share any or all functional characteristics with the spectral placement modules 110-710 of the exemplary systems 100-700 illustrated in FIGS. 1-7 and discussed previously.</p>

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	<p>Step 820 may, for example, comprise spectrally shifting the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with a second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, step 820 may comprise implementing a frequency-hopping scheme with the first baseband signal. For example, in a scenario where there are one or more frequency bands (e.g., a second frequency space) associated with a second baseband signal, step 820 may comprise spectrally shifting the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p>In another non-limiting exemplary scenario, spectrally shifting the first baseband signal may result in the production of a spectral image (e.g., frequency content mirrored about a mixing frequency utilized to spectrally shift the first baseband signal). In such a scenario, step 820 may comprise accepting or rejecting the image.</p> <p>In a scenario where an image is rejected, step 820 may comprise rejecting the image in any of a variety of manners. For example and without limitation, step 820 may comprise performing image reject mixing to spectrally shift the first baseband signal. Such image reject mixing generally comprises spectrally shifting a signal and rejecting an image associated with the spectrally shifted signal. Also for example, step 820 may comprise filtering out an unwanted image. The scope of various aspects of the present invention should not be limited by the utilization of image rejection or by any particular manner of performing such image rejection.</p> <p>The exemplary method 800 may, at step 830, comprise generating and/or receiving a second baseband signal corresponding to a second communication protocol (e.g., different from the first communication protocol). Step 830 may, for example and without limitation, share any or all functional characteristics with the second input 102 of the exemplary system 100 illustrated in FIG. 1 and discussed previously.</p>

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	<p>The second baseband signal may, for example, correspond to a second communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 830 comprises receiving the second baseband signal, step 830 may comprise receiving the second baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 830 may, for example, comprise generating the second baseband signal independently (e.g., corresponding to a communication independent of a communication associated with the first baseband signal). Step 830 may alternatively, for example, comprise generating the second baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the second baseband signal and the first baseband signal for a single communication).</p> <p><i>See, e.g., Rofougaran at 11:53-13:4.</i></p> <p>Furthermore, this claim element is obvious in light of Rofougaran itself, when combined with any of the other references as charted for this claim element in Exs. A-1–A-31, First Supplemental Ex. A-Obviousness Chart, and/or when combined with the knowledge of one of ordinary skill in the art. Motivations to combine may come from the knowledge of the person of ordinary skill themselves, or from the known problems and predictable solutions as embodied in these references. Further motivations to combine references and additional details may be found in the Cover Pleading and First Supplemental Ex. A-Obviousness Chart.</p>
[17.7] a power amplifier coupled to receive the first and second up-converted analog signals, wherein the bandwidth of the power amplifier is greater than the difference between a lowest frequency in the first up-	Rofougaran discloses “a power amplifier coupled to receive the first and second up-converted analog signals, wherein the bandwidth of the power amplifier is greater than the difference between a lowest frequency in the first up-converted frequency range and a highest frequency in the second up-converted frequency range.” See, e.g.:

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<p>converted frequency range and a highest frequency in the second up-converted frequency range.</p>	<p>The diagram illustrates a signal processing system for spectral placement. It starts with two baseband signals: a First Baseband Signal (201) and a Second Baseband Signal (202). These signals are processed by a Spectral Placement Module (210), which generates three signals: 211, 212, and 213. Signals 211 and 212 are positioned at frequencies f_s above and below a carrier frequency, respectively. Signal 213 is positioned at a frequency $-f_s$ below the carrier. These three signals are combined at a Signal Combiner (230). The combined signal is then fed into a mixer (247), which also receives a Local Oscillator (LO) signal (246). The mixer's output is a radio-frequency signal (RF) consisting of components 241, 242, 243, 244, and 245. This RF signal is then processed by a Power Amplifier (PA) (250) and a duplexer (252) before being transmitted as signal 254.</p>

Figure 2

See, e.g., Rofougaran at Figure 2.

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	<p>The diagram illustrates a signal processing chain for RF transmission. It begins with two baseband signals: the 1st Baseband Signal and the 2nd Baseband Signal. These signals are processed by two DACs (Digital-to-Analog Converters), labeled 592 and 594. The outputs of the DACs are fed into a Spectral Placement Module (510) and an optional second spectral placement module (520). The outputs from the modules are combined at a Signal Combiner (530). The combined signal then passes through an Upconverter (540) and an RF Xmit Stage (550) before being transmitted.</p>

Figure 5

See, e.g., Rofougaran at Figure 5.

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	<p>The diagram illustrates a communication system architecture. A 'First Baseband Signal' enters a 'Spectral Placement Module' (710). A 'Second Baseband Signal' enters an 'Optional Second Spectral Placement Module' (720). Both modules output signals to mixers. The mixer for the first module receives a local oscillator signal from 'LO1' (e.g., 2.446 GHz) and outputs to a 'RF Signal Combiner' (730). The mixer for the second module receives a local oscillator signal from 'LO2' (e.g., 2.486 GHz) and also outputs to the 'RF Signal Combiner'. The 'RF Signal Combiner' then feeds into an 'RF Xmit Stage' (750), which transmits the final signal.</p>

Figure 7

See, e.g., Rofougaran at Figure 7.

FIG. 1 is a diagram showing a portion of a first non-limiting exemplary communication system 100, in accordance with various aspects of the present invention. The communication system (or device) may comprise characteristics of any of a variety of communication systems/devices (e.g., multimode wireless communication devices). For example and without limitation, the communication system may comprise characteristics of any of a variety of mobile wireless communication devices (e.g.,

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	<p>cellular phones, paging devices, portable email devices, etc.). Also for example, the communication system may comprise characteristics of fixed communication systems or devices (e.g., network access points, base stations, satellites, wireless routers, set top boxes, etc.). Further for example, the communication system may comprise characteristics of a variety of electronic devices with wireless communication capability (e.g., televisions, music players, cameras, remote controls, personal digital assistants, handheld computers, gaming devices, etc.). Accordingly, the scope of various aspects of the present invention should not be limited by characteristics of particular communication systems or devices.</p> <p>The following discussion will, at times, refer to various communication modes. A multimode communication device may, for example, be adapted to communicate in a plurality of such communication modes. For the following discussion, a communication mode may generally be considered to coincide with communication utilizing a particular communication protocol or standard. A non-limiting list of exemplary communication protocols includes various cellular communication protocols (e.g., GSM, GPRS, EDGE, CDMA, WCDMA, TDMA, PDC, etc.), various wireless networking protocols or standards, including WLAN, WMAN, WPAN and WWAN (e.g., IEEE 802.11, Bluetooth, IEEE 802.15, UWB, IEEE 802.16, IEEE 802.20, Zigbee, any WiFi protocol, etc.), various television communication standards, etc. The scope of various aspects of the present invention should not be limited by characteristics of particular communication modes or protocols, whether standard or proprietary.</p> <p>The exemplary communication system 100 may comprise at least a first input 101 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to any of the previously mentioned communication protocols.</p> <p>The exemplary communication system 100 may also comprise at least a second input 102 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first</p>

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	<p>communication protocol discussed above). For example and without limitation, the second baseband signal may correspond to any of the previously mentioned communication protocols. The first baseband signal and the second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of the communication system 100. For example, such modules may generate the first and second baseband signals independently (e.g., corresponding to independent respective communications). Alternatively, for example, such modules may generate the first and second baseband signals in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first and second baseband signals for a single communication).</p> <p>The exemplary communication system 100 may additionally comprise a spectral placement module 110 that is adapted to spectrally shift the first baseband signal (i.e., shift the frequency spectrum of the first baseband signal). In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to spectrally shift the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with the second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to implement a frequency-hopping scheme with the first baseband signal. For example, in a scenario, where there are one or more frequency bands (e.g., a second frequency space) associated with the second baseband signal, the spectral placement module 110 may be adapted to shift the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p><i>See, e.g., Rofougaran at 2:38-3:58.</i></p> <p>The exemplary communication system 100 may also comprise a second spectral placement module 120. Such a second spectral placement module 120 may, for example, share any or all characteristics</p>

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	<p>with the spectral placement module 110 discussed previously. The incorporation of such a second spectral placement module 120 may, for example, provide spectral shifting flexibility. For example, in such an exemplary configuration, either or both of the first and second baseband signals may be spectrally shifted to substantially distinct frequency spaces. Also for example, in such an exemplary configuration, either or both of the first and second baseband signals may be frequency hopped. Note that though the second spectral placement module 120 is illustrated separate from the first spectral placement module 110, the second spectral placement module 120 may share any or all hardware and/or software components with the spectral placement module 110.</p> <p>The exemplary communication system 100 may further comprise a signal combiner 130 that is adapted to generate a composite signal comprising various input signals to the signal combiner 130. For example, the composite signal may simultaneously (i.e., at an instant in time) comprise components associated with various input signals. Note that such simultaneity need not always be present. For example, at a first instant in time, the signal output from the signal combiner 130 might comprise a plurality of components associated with a plurality of respective input signals, at a second instant in time, the signal output from the signal combiner 130 might comprise a single component associated with a single respective input signal, and at a third instant in time, the signal output from the signal combiner 130 might comprise no components.</p> <p>In a first non-limiting exemplary scenario, the signal combiner 130 may receive a first signal that is based on the first baseband signal (e.g., associated with a first communication protocol). Also, the signal combiner 130 may receive a second signal that is based on the second baseband signal (e.g., associated with a second communication protocol). In such a scenario, the signal combiner 130 may combine the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the first baseband signal and a second signal component based on the second baseband signal. In such a scenario, for example where the frequency spectra of the first and second baseband signals do not overlap, the first and second baseband signals might not be spectrally shifted prior to combining by the signal combiner 130. In such a scenario, the spectral placement module 110 (and optionally, the second spectral placement module 120) may receive a control signal indicating whether or not to perform spectral shifting and/or to what degree spectral shifting should be implemented.</p>

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	<p><i>See, e.g.</i>, Rofougaran at 4:16-67.</p> <p>Various components of the exemplary communication system 100 (and other communication systems illustrated and discussed herein) may be implemented in analog and/or digital circuitry. To illustrate this, the exemplary communication system 100 is not shown with analog-to-digital converters (ADCs) or digital-to-analog converters (DACs). FIGS. 4-6, to be discussed later, show various non-limiting exemplary configurations including such converters.</p> <p>FIG. 2 is a diagram showing a portion of a second non-limiting exemplary communication system 200, in accordance with various aspects of the present invention. The communication system 200 may, for example and without limitation, share any or all characteristics with the communication system 100 illustrated in FIG. 1 and discussed previously.</p> <p>The exemplary communication system 200 may comprise at least a first input 201 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to the Bluetooth communication protocol. FIG. 2 shows an exemplary frequency spectrum 203 associated with the first baseband signal.</p> <p>The exemplary communication system 200 may also comprise at least a second input 202 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first communication protocol discussed above). For example and without limitation, the first baseband signal may correspond to an IEEE 802.11 communication protocol (e.g., IEEE 802.11(b) or IEEE 802.11(g)). FIG. 2 shows an exemplary frequency spectrum 204 associated with the second baseband signal.</p> <p><i>See, e.g.</i>, Rofougaran at 5:64-6:31.</p>

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	<p>In a non-limiting exemplary configuration illustrated in FIG. 2, the signal combiner 230 receives a first signal from the spectral placement module 210 that is based on the spectrally shifted first baseband signal. Also, the signal combiner 230 receives a second signal that is based on the second baseband signal. In such a configuration, the signal combiner 230 combines the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the spectrally shifted first baseband signal and a second signal component based on the second baseband signal (e.g., not spectrally shifted).</p> <p>FIG. 2 shows an exemplary frequency spectrum 231 associated with the composite signal formed by the signal combiner 230. The spectrum 231 comprises a first portion 233 corresponding to the first signal component, and a second portion 232 corresponding to the second signal component. Note that the first portion 233 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 232.</p> <p>The exemplary communication system 200 may also comprise an upconverter 240 adapted to upconvert a signal (e.g., the composite signal from the signal combiner 230) for transmission. The upconverter 240 may, for example and without limitation, share any or all characteristics with the upconverter 140 discussed previously.</p> <p>The upconverter 240 may, for example, comprise a mixer 247, a local oscillator 246 and one or more filters 248. The mixer 247 may, for example, receive the composite signal from the signal combiner 230 and an RF mixing signal at frequency fRF from a local oscillator 246. The upconverter 240 may, for example, filter the upconverted signal from the mixer 247 with one or more filters 248. The output of the upconverter 240 may, for example, comprise a signal indicative of the composite signal spectrally shifted to an RF frequency.</p> <p>FIG. 2 shows an exemplary frequency spectrum 241 associated with the RF signal formed by the upconverter 240. The frequency spectrum 241 comprises a first portion 243 corresponding to the first signal component and a second portion 242 corresponding to the second signal component. Note that the first portion 243 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 242. Also note that the first portion 243 and</p>

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	<p>second portion 242 might be formed with a first mirror portion 244 and second mirror portion 245, respectively. Note that a mirror portion may either be removed or may be kept for later processing. The exemplary communication system 200 may further comprise a RF transmission stage 250 adapted to transmit an RF signal. The RF transmission stage 250 may, for example and without limitation, share any or all characteristics with the RF transmission stage 150 discussed previously. Such an RF signal may, for example, be associated with the composite signal output from the signal combiner 230 and upconverted by the upconverter 240. The RF transmission stage 250 may, for example and without limitation, comprise a power amplifier 252, antenna 254 and other components generally associated with RF signal transmission.</p> <p><i>See, e.g., Rofougaran at 6:66-7:57.</i></p> <p>For example, the spectral placement module 510, optional second spectral placement module 520 and signal combiner 530 may operate in the analog domain. The first digital-to-analog converter 592 may convert the first baseband signal to the analog domain for processing by the spectral placement module 510. The second digital-to-analog converter 594 may convert the second baseband signal to the analog domain for processing by the second spectral placement module 520 or signal combiner 530. The signal combiner 530 then combines signals in the analog domain to generate an analog composite signal, which is then upconverted and transmitted by the upconverter 540 and RF transmission stage 550, respectively.</p> <p><i>See, e.g., Rofougaran at 9:30-41.</i></p> <p>FIG. 7 is a diagram showing a portion of a seventh non-limiting exemplary communication system 700, in accordance with various aspects of the present invention. The exemplary communication system 700 may, for example and without limitation, share any or all characteristics with the exemplary systems 100-600 illustrated in FIGS. 1-6 and discussed previously.</p> <p>The exemplary communication system 700 may comprise a first mixer 744 that receives a spectrally shifted first baseband signal from the spectral placement module 710 and a first RF mixing signal (e.g., a 2.446 GHz signal generally associated with the Bluetooth communication protocol) from a</p>

Claim 17 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>first local oscillator 742. The exemplary communication system 700 may also comprise a second mixer 748 that receives a second baseband signal (or a spectrally shifted second baseband signal) and a second RF mixing signal (e.g., a 2.486 GHz signal generally associated with the IEEE 802.11(g) communication protocol) from a second local oscillator 746.</p> <p>The exemplary communication system 700 may comprise an RF signal combiner 730 that is adapted to combine input RF signals. The RF signal combiner 730 may, for example, receive and combine the output signals from the first mixer 744 and second mixer 748 to generate an RF composite signal. The exemplary communication system 700 may also comprise a RF transmission stage 750 that receives the RF composite signal from the RF signal combiner 730 and transmit the signal.</p> <p><i>See, e.g., Rofougaran at 10:18-43.</i></p> <p>The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 810 comprises receiving the first baseband signal, step 810 may comprise receiving the first baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The first baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 810 may, for example, comprise generating the first baseband signal independently (e.g., corresponding to an independent communication). Step 810 may alternatively, for example, comprise generating the first baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first baseband signal and other baseband signals for a single communication).</p> <p>The exemplary method 800 may, at step 820, comprise spectrally placing (or shifting) the first baseband signal (e.g., received at step 810). Step 820 may, for example and without limitation, share any or all functional characteristics with the spectral placement modules 110-710 of the exemplary systems 100-700 illustrated in FIGS. 1-7 and discussed previously.</p>

Claim 17 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>Step 820 may, for example, comprise spectrally shifting the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with a second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, step 820 may comprise implementing a frequency-hopping scheme with the first baseband signal. For example, in a scenario where there are one or more frequency bands (e.g., a second frequency space) associated with a second baseband signal, step 820 may comprise spectrally shifting the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p>In another non-limiting exemplary scenario, spectrally shifting the first baseband signal may result in the production of a spectral image (e.g., frequency content mirrored about a mixing frequency utilized to spectrally shift the first baseband signal). In such a scenario, step 820 may comprise accepting or rejecting the image.</p> <p>In a scenario where an image is rejected, step 820 may comprise rejecting the image in any of a variety of manners. For example and without limitation, step 820 may comprise performing image reject mixing to spectrally shift the first baseband signal. Such image reject mixing generally comprises spectrally shifting a signal and rejecting an image associated with the spectrally shifted signal. Also for example, step 820 may comprise filtering out an unwanted image. The scope of various aspects of the present invention should not be limited by the utilization of image rejection or by any particular manner of performing such image rejection.</p> <p>The exemplary method 800 may, at step 830, comprise generating and/or receiving a second baseband signal corresponding to a second communication protocol (e.g., different from the first communication protocol). Step 830 may, for example and without limitation, share any or all functional characteristics with the second input 102 of the exemplary system 100 illustrated in FIG. 1 and discussed previously.</p>

Claim 17 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>The second baseband signal may, for example, correspond to a second communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 830 comprises receiving the second baseband signal, step 830 may comprise receiving the second baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 830 may, for example, comprise generating the second baseband signal independently (e.g., corresponding to a communication independent of a communication associated with the first baseband signal). Step 830 may alternatively, for example, comprise generating the second baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the second baseband signal and the first baseband signal for a single communication).</p> <p><i>See, e.g., Rofougaran at 11:53-13:4.</i></p> <p>Furthermore, this claim element is obvious in light of Rofougaran itself, when combined with any of the other references as charted for this claim element in Exs. A-1–A-31, First Supplemental Ex. A–Obviousness Chart, and/or when combined with the knowledge of one of ordinary skill in the art. Motivations to combine may come from the knowledge of the person of ordinary skill themselves, or from the known problems and predictable solutions as embodied in these references. Further motivations to combine references and additional details may be found in the Cover Pleading and First Supplemental Ex. A–Obviousness Chart.</p>

Claim 21 of the '802 Patent	Prior Art Reference – Rofougaran
[21.1] The communication system of claim 17	Rofougaran discloses all the elements of claim 17 for all the reasons provided above.
[21.2] wherein the first data of the first digital signal is encoded using a first wireless	Rofougaran discloses “wherein the first data of the first digital signal is encoded using a first wireless protocol and the first data of the second digital signal is encoded using a second wireless protocol.” See, e.g.:

Claim 21 of the '802 Patent	Prior Art Reference – Rofougaran
protocol and the first data of the second digital signal is encoded using a second wireless protocol.	<p>FIG. 1 is a diagram showing a portion of a first non-limiting exemplary communication system 100, in accordance with various aspects of the present invention. The communication system (or device) may comprise characteristics of any of a variety of communication systems/devices (e.g., multimode wireless communication devices). For example and without limitation, the communication system may comprise characteristics of any of a variety of mobile wireless communication devices (e.g., cellular phones, paging devices, portable email devices, etc.). Also for example, the communication system may comprise characteristics of fixed communication systems or devices (e.g., network access points, base stations, satellites, wireless routers, set top boxes, etc.). Further for example, the communication system may comprise characteristics of a variety of electronic devices with wireless communication capability (e.g., televisions, music players, cameras, remote controls, personal digital assistants, handheld computers, gaming devices, etc.). Accordingly, the scope of various aspects of the present invention should not be limited by characteristics of particular communication systems or devices.</p> <p>The following discussion will, at times, refer to various communication modes. A multimode communication device may, for example, be adapted to communicate in a plurality of such communication modes. For the following discussion, a communication mode may generally be considered to coincide with communication utilizing a particular communication protocol or standard. A non-limiting list of exemplary communication protocols includes various cellular communication protocols (e.g., GSM, GPRS, EDGE, CDMA, WCDMA, TDMA, PDC, etc.), various wireless networking protocols or standards, including WLAN, WMAN, WPAN and WWAN (e.g., IEEE 802.11, Bluetooth, IEEE 802.15, UWB, IEEE 802.16, IEEE 802.20, Zigbee, any WiFi protocol, etc.), various television communication standards, etc. The scope of various aspects of the present invention should not be limited by characteristics of particular communication modes or protocols, whether standard or proprietary.</p> <p>The exemplary communication system 100 may comprise at least a first input 101 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or</p>

Claim 21 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>standards). For example and without limitation, the first baseband signal may correspond to any of the previously mentioned communication protocols.</p> <p>The exemplary communication system 100 may also comprise at least a second input 102 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first communication protocol discussed above). For example and without limitation, the second baseband signal may correspond to any of the previously mentioned communication protocols.</p> <p>The first baseband signal and the second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of the communication system 100. For example, such modules may generate the first and second baseband signals independently (e.g., corresponding to independent respective communications). Alternatively, for example, such modules may generate the first and second baseband signals in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first and second baseband signals for a single communication).</p> <p>The exemplary communication system 100 may additionally comprise a spectral placement module 110 that is adapted to spectrally shift the first baseband signal (i.e., shift the frequency spectrum of the first baseband signal). In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to spectrally shift the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with the second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to implement a frequency-hopping scheme with the first baseband signal. For example, in a scenario, where there are one or more frequency bands (e.g., a second frequency space) associated with the second baseband signal, the spectral placement module 110 may be adapted to shift the first baseband</p>

Claim 21 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p><i>See, e.g.,</i> Rofougaran at 2:38-3:58.</p> <p>The exemplary communication system 100 may also comprise a second spectral placement module 120. Such a second spectral placement module 120 may, for example, share any or all characteristics with the spectral placement module 110 discussed previously. The incorporation of such a second spectral placement module 120 may, for example, provide spectral shifting flexibility. For example, in such an exemplary configuration, either or both of the first and second baseband signals may be spectrally shifted to substantially distinct frequency spaces. Also for example, in such an exemplary configuration, either or both of the first and second baseband signals may be frequency hopped. Note that though the second spectral placement module 120 is illustrated separate from the first spectral placement module 110, the second spectral placement module 120 may share any or all hardware and/or software components with the spectral placement module 110.</p> <p>The exemplary communication system 100 may further comprise a signal combiner 130 that is adapted to generate a composite signal comprising various input signals to the signal combiner 130. For example, the composite signal may simultaneously (i.e., at an instant in time) comprise components associated with various input signals. Note that such simultaneity need not always be present. For example, at a first instant in time, the signal output from the signal combiner 130 might comprise a plurality of components associated with a plurality of respective input signals, at a second instant in time, the signal output from the signal combiner 130 might comprise a single component associated with a single respective input signal, and at a third instant in time, the signal output from the signal combiner 130 might comprise no components.</p> <p>In a first non-limiting exemplary scenario, the signal combiner 130 may receive a first signal that is based on the first baseband signal (e.g., associated with a first communication protocol). Also, the signal combiner 130 may receive a second signal that is based on the second baseband signal (e.g., associated with a second communication protocol). In such a scenario, the signal combiner 130 may combine the first and second signals to generate a composite signal, where the composite signal</p>

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	<p>simultaneously comprises a first signal component based on the first baseband signal and a second signal component based on the second baseband signal. In such a scenario, for example where the frequency spectra of the first and second baseband signals do not overlap, the first and second baseband signals might not be spectrally shifted prior to combining by the signal combiner 130. In such a scenario, the spectral placement module 110 (and optionally, the second spectral placement module 120) may receive a control signal indicating whether or not to perform spectral shifting and/or to what degree spectral shifting should be implemented.</p> <p><i>See, e.g., Rofougaran at 4:16-67.</i></p> <p>Various components of the exemplary communication system 100 (and other communication systems illustrated and discussed herein) may be implemented in analog and/or digital circuitry. To illustrate this, the exemplary communication system 100 is not shown with analog-to-digital converters (ADCs) or digital-to-analog converters (DACs). FIGS. 4-6, to be discussed later, show various non-limiting exemplary configurations including such converters.</p> <p>FIG. 2 is a diagram showing a portion of a second non-limiting exemplary communication system 200, in accordance with various aspects of the present invention. The communication system 200 may, for example and without limitation, share any or all characteristics with the communication system 100 illustrated in FIG. 1 and discussed previously.</p> <p>The exemplary communication system 200 may comprise at least a first input 201 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to the Bluetooth communication protocol. FIG. 2 shows an exemplary frequency spectrum 203 associated with the first baseband signal.</p> <p>The exemplary communication system 200 may also comprise at least a second input 202 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first</p>

Claim 21 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>communication protocol discussed above). For example and without limitation, the first baseband signal may correspond to an IEEE 802.11 communication protocol (e.g., IEEE 802.11(b) or IEEE 802.11(g)). FIG. 2 shows an exemplary frequency spectrum 204 associated with the second baseband signal.</p> <p><i>See, e.g., Rofougaran at 5:64-6:31.</i></p> <p>In a non-limiting exemplary configuration illustrated in FIG. 2, the signal combiner 230 receives a first signal from the spectral placement module 210 that is based on the spectrally shifted first baseband signal. Also, the signal combiner 230 receives a second signal that is based on the second baseband signal. In such a configuration, the signal combiner 230 combines the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the spectrally shifted first baseband signal and a second signal component based on the second baseband signal (e.g., not spectrally shifted).</p> <p>FIG. 2 shows an exemplary frequency spectrum 231 associated with the composite signal formed by the signal combiner 230. The spectrum 231 comprises a first portion 233 corresponding to the first signal component, and a second portion 232 corresponding to the second signal component. Note that the first portion 233 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 232.</p> <p>The exemplary communication system 200 may also comprise an upconverter 240 adapted to upconvert a signal (e.g., the composite signal from the signal combiner 230) for transmission. The upconverter 240 may, for example and without limitation, share any or all characteristics with the upconverter 140 discussed previously.</p> <p>The upconverter 240 may, for example, comprise a mixer 247, a local oscillator 246 and one or more filters 248. The mixer 247 may, for example, receive the composite signal from the signal combiner 230 and an RF mixing signal at frequency fRF from a local oscillator 246. The upconverter 240 may, for example, filter the upconverted signal from the mixer 247 with one or more filters 248. The</p>

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	<p>output of the upconverter 240 may, for example, comprise a signal indicative of the composite signal spectrally shifted to an RF frequency.</p> <p>FIG. 2 shows an exemplary frequency spectrum 241 associated with the RF signal formed by the upconverter 240. The frequency spectrum 241 comprises a first portion 243 corresponding to the first signal component and a second portion 242 corresponding to the second signal component. Note that the first portion 243 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 242. Also note that the first portion 243 and second portion 242 might be formed with a first mirror portion 244 and second mirror portion 245, respectively. Note that a mirror portion may either be removed or may be kept for later processing. The exemplary communication system 200 may further comprise a RF transmission stage 250 adapted to transmit an RF signal. The RF transmission stage 250 may, for example and without limitation, share any or all characteristics with the RF transmission stage 150 discussed previously. Such an RF signal may, for example, be associated with the composite signal output from the signal combiner 230 and upconverted by the upconverter 240. The RF transmission stage 250 may, for example and without limitation, comprise a power amplifier 252, antenna 254 and other components generally associated with RF signal transmission.</p> <p><i>See, e.g., Rofougaran at 6:66-7:57.</i></p> <p>For example, the spectral placement module 510, optional second spectral placement module 520 and signal combiner 530 may operate in the analog domain. The first digital-to-analog converter 592 may convert the first baseband signal to the analog domain for processing by the spectral placement module 510. The second digital-to-analog converter 594 may convert the second baseband signal to the analog domain for processing by the second spectral placement module 520 or signal combiner 530. The signal combiner 530 then combines signals in the analog domain to generate an analog composite signal, which is then upconverted and transmitted by the upconverter 540 and RF transmission stage 550, respectively.</p> <p><i>See, e.g., Rofougaran at 9:30-41.</i></p>

Claim 21 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>FIG. 7 is a diagram showing a portion of a seventh non-limiting exemplary communication system 700, in accordance with various aspects of the present invention. The exemplary communication system 700 may, for example and without limitation, share any or all characteristics with the exemplary systems 100-600 illustrated in FIGS. 1-6 and discussed previously.</p> <p>The exemplary communication system 700 may comprise a first mixer 744 that receives a spectrally shifted first baseband signal from the spectral placement module 710 and a first RF mixing signal (e.g., a 2.446 GHz signal generally associated with the Bluetooth communication protocol) from a first local oscillator 742. The exemplary communication system 700 may also comprise a second mixer 748 that receives a second baseband signal (or a spectrally shifted second baseband signal) and a second RF mixing signal (e.g., a 2.486 GHz signal generally associated with the IEEE 802.11(g) communication protocol) from a second local oscillator 746.</p> <p>The exemplary communication system 700 may comprise an RF signal combiner 730 that is adapted to combine input RF signals. The RF signal combiner 730 may, for example, receive and combine the output signals from the first mixer 744 and second mixer 748 to generate an RF composite signal. The exemplary communication system 700 may also comprise a RF transmission stage 750 that receives the RF composite signal from the RF signal combiner 730 and transmit the signal.</p> <p><i>See, e.g., Rofougaran at 10:18-43.</i></p> <p>The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 810 comprises receiving the first baseband signal, step 810 may comprise receiving the first baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The first baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 810 may, for example, comprise generating the first baseband signal independently (e.g., corresponding to an independent communication). Step 810 may alternatively, for example, comprise generating the first baseband signal in a dependent manner (e.g., coordinating independent respective</p>

Claim 21 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>communications or utilizing both the first baseband signal and other baseband signals for a single communication).</p> <p>The exemplary method 800 may, at step 820, comprise spectrally placing (or shifting) the first baseband signal (e.g., received at step 810). Step 820 may, for example and without limitation, share any or all functional characteristics with the spectral placement modules 110-710 of the exemplary systems 100-700 illustrated in FIGS. 1-7 and discussed previously.</p> <p>Step 820 may, for example, comprise spectrally shifting the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with a second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, step 820 may comprise implementing a frequency-hopping scheme with the first baseband signal. For example, in a scenario where there are one or more frequency bands (e.g., a second frequency space) associated with a second baseband signal, step 820 may comprise spectrally shifting the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p>In another non-limiting exemplary scenario, spectrally shifting the first baseband signal may result in the production of a spectral image (e.g., frequency content mirrored about a mixing frequency utilized to spectrally shift the first baseband signal). In such a scenario, step 820 may comprise accepting or rejecting the image.</p> <p>In a scenario where an image is rejected, step 820 may comprise rejecting the image in any of a variety of manners. For example and without limitation, step 820 may comprise performing image reject mixing to spectrally shift the first baseband signal. Such image reject mixing generally comprises spectrally shifting a signal and rejecting an image associated with the spectrally shifted signal. Also for example, step 820 may comprise filtering out an unwanted image. The scope of</p>

Claim 21 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>various aspects of the present invention should not be limited by the utilization of image rejection or by any particular manner of performing such image rejection.</p> <p>The exemplary method 800 may, at step 830, comprise generating and/or receiving a second baseband signal corresponding to a second communication protocol (e.g., different from the first communication protocol). Step 830 may, for example and without limitation, share any or all functional characteristics with the second input 102 of the exemplary system 100 illustrated in FIG. 1 and discussed previously.</p> <p>The second baseband signal may, for example, correspond to a second communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 830 comprises receiving the second baseband signal, step 830 may comprise receiving the second baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 830 may, for example, comprise generating the second baseband signal independently (e.g., corresponding to a communication independent of a communication associated with the first baseband signal). Step 830 may alternatively, for example, comprise generating the second baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the second baseband signal and the first baseband signal for a single communication).</p> <p><i>See, e.g., Rofougaran at 11:53-13:4.</i></p> <p>Furthermore, this claim element is obvious in light of Rofougaran itself, when combined with any of the other references as charted for this claim element in Exs. A-1–A-31, First Supplemental Ex. A–Obviousness Chart, and/or when combined with the knowledge of one of ordinary skill in the art. Motivations to combine may come from the knowledge of the person of ordinary skill themselves, or from the known problems and predictable solutions as embodied in these references. Further motivations to combine references and additional details may be found in the Cover Pleading and First Supplemental Ex. A–Obviousness Chart.</p>

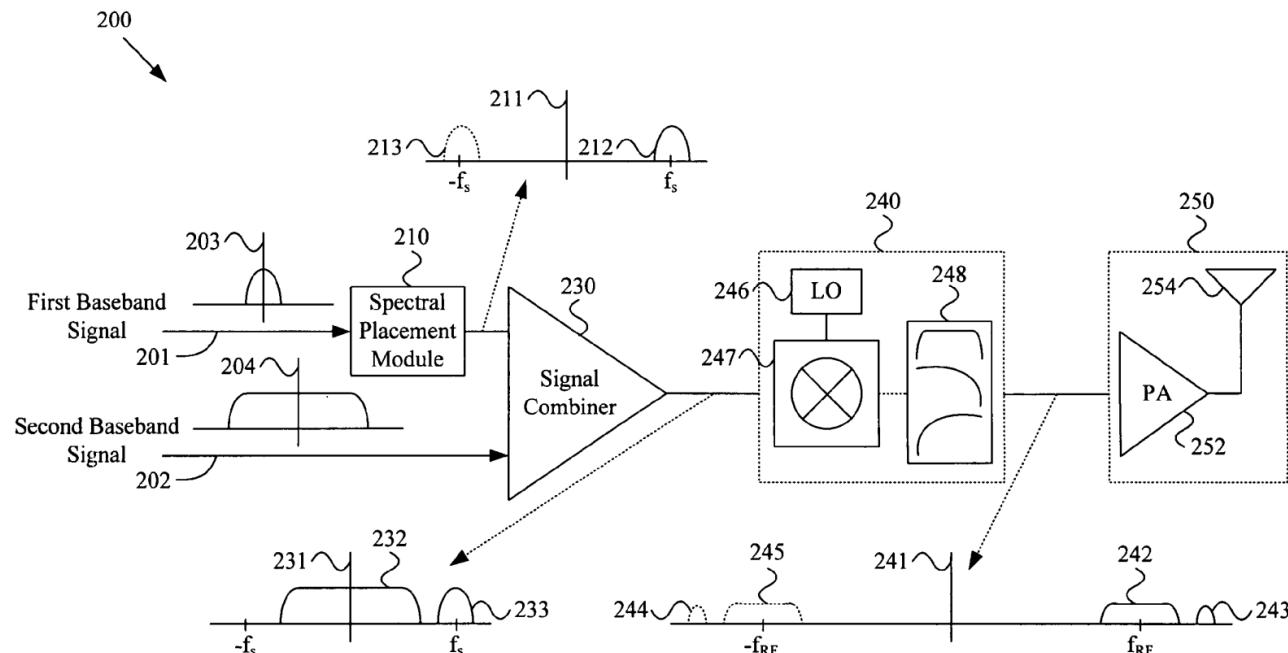
Claim 22 of the '802 Patent	Prior Art Reference – Rofougaran
[22.1] The communication system of claim 17	Rofougaran discloses all the elements of claim 17 for all the reasons provided above.
[22.2] wherein the second data corresponds to the first data and wherein the power amplifier outputs a third up-converted signal comprising the up-converted first analog signal and the up-converted second analog signal.	<p>Rofougaran discloses “wherein the second data corresponds to the first data and wherein the power amplifier outputs a third up-converted signal comprising the up-converted first analog signal and the up-converted second analog signal.” See, e.g.:</p> 

Figure 2

See, e.g., Rofougaran at Figure 2.

Claim 22 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>The diagram illustrates a signal processing chain for RF transmission. It begins with two baseband signals: the 1st Baseband Signal and the 2nd Baseband Signal. These signals are processed by two DACs (Digital-to-Analog Converters), labeled 592 and 594. The outputs of the DACs are fed into a Spectral Placement Module (510) and an optional second spectral placement module (520). The outputs from the modules are combined at a Signal Combiner (530). The combined signal then passes through an Upconverter (540) and an RF Xmit Stage (550) before being transmitted.</p> <p>Figure 5</p> <p><i>See, e.g., Rofougaran at Figure 5.</i></p>

Claim 22 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>The diagram illustrates a communication system architecture. It starts with two baseband signal inputs: a "First Baseband Signal" and a "Second Baseband Signal". The First Baseband Signal is processed by a "Spectral Placement Module" (710). This module is connected to a mixer (744), which also receives a local oscillator signal from "LO1" (e.g., 2.446 GHz). The output of the mixer is then sent to an "RF Signal Combiner" (730). The Second Baseband Signal is processed by an "Optional Second Spectral Placement Module" (720). This module is connected to another mixer (748), which receives a local oscillator signal from "LO2" (e.g., 2.486 GHz). The output of this second mixer is also sent to the "RF Signal Combiner" (730). Finally, the combined signal from the "RF Signal Combiner" passes through an "RF Xmit Stage" (750) for transmission.</p>

Figure 7

See, e.g., Rofougaran at Figure 7.

FIG. 1 is a diagram showing a portion of a first non-limiting exemplary communication system 100, in accordance with various aspects of the present invention. The communication system (or device) may comprise characteristics of any of a variety of communication systems/devices (e.g., multimode wireless communication devices). For example and without limitation, the communication system may comprise characteristics of any of a variety of mobile wireless communication devices (e.g.,

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	<p>cellular phones, paging devices, portable email devices, etc.). Also for example, the communication system may comprise characteristics of fixed communication systems or devices (e.g., network access points, base stations, satellites, wireless routers, set top boxes, etc.). Further for example, the communication system may comprise characteristics of a variety of electronic devices with wireless communication capability (e.g., televisions, music players, cameras, remote controls, personal digital assistants, handheld computers, gaming devices, etc.). Accordingly, the scope of various aspects of the present invention should not be limited by characteristics of particular communication systems or devices.</p> <p>The following discussion will, at times, refer to various communication modes. A multimode communication device may, for example, be adapted to communicate in a plurality of such communication modes. For the following discussion, a communication mode may generally be considered to coincide with communication utilizing a particular communication protocol or standard. A non-limiting list of exemplary communication protocols includes various cellular communication protocols (e.g., GSM, GPRS, EDGE, CDMA, WCDMA, TDMA, PDC, etc.), various wireless networking protocols or standards, including WLAN, WMAN, WPAN and WWAN (e.g., IEEE 802.11, Bluetooth, IEEE 802.15, UWB, IEEE 802.16, IEEE 802.20, Zigbee, any WiFi protocol, etc.), various television communication standards, etc. The scope of various aspects of the present invention should not be limited by characteristics of particular communication modes or protocols, whether standard or proprietary.</p> <p>The exemplary communication system 100 may comprise at least a first input 101 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to any of the previously mentioned communication protocols.</p> <p>The exemplary communication system 100 may also comprise at least a second input 102 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first</p>

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	<p>communication protocol discussed above). For example and without limitation, the second baseband signal may correspond to any of the previously mentioned communication protocols. The first baseband signal and the second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of the communication system 100. For example, such modules may generate the first and second baseband signals independently (e.g., corresponding to independent respective communications). Alternatively, for example, such modules may generate the first and second baseband signals in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first and second baseband signals for a single communication).</p> <p>The exemplary communication system 100 may additionally comprise a spectral placement module 110 that is adapted to spectrally shift the first baseband signal (i.e., shift the frequency spectrum of the first baseband signal). In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to spectrally shift the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with the second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to implement a frequency-hopping scheme with the first baseband signal. For example, in a scenario, where there are one or more frequency bands (e.g., a second frequency space) associated with the second baseband signal, the spectral placement module 110 may be adapted to shift the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p><i>See, e.g., Rofougaran at 2:38-3:58.</i></p> <p>The exemplary communication system 100 may also comprise a second spectral placement module 120. Such a second spectral placement module 120 may, for example, share any or all characteristics</p>

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	<p>with the spectral placement module 110 discussed previously. The incorporation of such a second spectral placement module 120 may, for example, provide spectral shifting flexibility. For example, in such an exemplary configuration, either or both of the first and second baseband signals may be spectrally shifted to substantially distinct frequency spaces. Also for example, in such an exemplary configuration, either or both of the first and second baseband signals may be frequency hopped. Note that though the second spectral placement module 120 is illustrated separate from the first spectral placement module 110, the second spectral placement module 120 may share any or all hardware and/or software components with the spectral placement module 110.</p> <p>The exemplary communication system 100 may further comprise a signal combiner 130 that is adapted to generate a composite signal comprising various input signals to the signal combiner 130. For example, the composite signal may simultaneously (i.e., at an instant in time) comprise components associated with various input signals. Note that such simultaneity need not always be present. For example, at a first instant in time, the signal output from the signal combiner 130 might comprise a plurality of components associated with a plurality of respective input signals, at a second instant in time, the signal output from the signal combiner 130 might comprise a single component associated with a single respective input signal, and at a third instant in time, the signal output from the signal combiner 130 might comprise no components.</p> <p>In a first non-limiting exemplary scenario, the signal combiner 130 may receive a first signal that is based on the first baseband signal (e.g., associated with a first communication protocol). Also, the signal combiner 130 may receive a second signal that is based on the second baseband signal (e.g., associated with a second communication protocol). In such a scenario, the signal combiner 130 may combine the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the first baseband signal and a second signal component based on the second baseband signal. In such a scenario, for example where the frequency spectra of the first and second baseband signals do not overlap, the first and second baseband signals might not be spectrally shifted prior to combining by the signal combiner 130. In such a scenario, the spectral placement module 110 (and optionally, the second spectral placement module 120) may receive a control signal indicating whether or not to perform spectral shifting and/or to what degree spectral shifting should be implemented.</p>

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	<p><i>See, e.g.</i>, Rofougaran at 4:16-67.</p> <p>Various components of the exemplary communication system 100 (and other communication systems illustrated and discussed herein) may be implemented in analog and/or digital circuitry. To illustrate this, the exemplary communication system 100 is not shown with analog-to-digital converters (ADCs) or digital-to-analog converters (DACs). FIGS. 4-6, to be discussed later, show various non-limiting exemplary configurations including such converters.</p> <p>FIG. 2 is a diagram showing a portion of a second non-limiting exemplary communication system 200, in accordance with various aspects of the present invention. The communication system 200 may, for example and without limitation, share any or all characteristics with the communication system 100 illustrated in FIG. 1 and discussed previously.</p> <p>The exemplary communication system 200 may comprise at least a first input 201 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to the Bluetooth communication protocol. FIG. 2 shows an exemplary frequency spectrum 203 associated with the first baseband signal.</p> <p>The exemplary communication system 200 may also comprise at least a second input 202 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first communication protocol discussed above). For example and without limitation, the first baseband signal may correspond to an IEEE 802.11 communication protocol (e.g., IEEE 802.11(b) or IEEE 802.11(g)). FIG. 2 shows an exemplary frequency spectrum 204 associated with the second baseband signal.</p> <p><i>See, e.g.</i>, Rofougaran at 5:64-6:31.</p>

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	<p>In a non-limiting exemplary configuration illustrated in FIG. 2, the signal combiner 230 receives a first signal from the spectral placement module 210 that is based on the spectrally shifted first baseband signal. Also, the signal combiner 230 receives a second signal that is based on the second baseband signal. In such a configuration, the signal combiner 230 combines the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the spectrally shifted first baseband signal and a second signal component based on the second baseband signal (e.g., not spectrally shifted).</p> <p>FIG. 2 shows an exemplary frequency spectrum 231 associated with the composite signal formed by the signal combiner 230. The spectrum 231 comprises a first portion 233 corresponding to the first signal component, and a second portion 232 corresponding to the second signal component. Note that the first portion 233 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 232.</p> <p>The exemplary communication system 200 may also comprise an upconverter 240 adapted to upconvert a signal (e.g., the composite signal from the signal combiner 230) for transmission. The upconverter 240 may, for example and without limitation, share any or all characteristics with the upconverter 140 discussed previously.</p> <p>The upconverter 240 may, for example, comprise a mixer 247, a local oscillator 246 and one or more filters 248. The mixer 247 may, for example, receive the composite signal from the signal combiner 230 and an RF mixing signal at frequency fRF from a local oscillator 246. The upconverter 240 may, for example, filter the upconverted signal from the mixer 247 with one or more filters 248. The output of the upconverter 240 may, for example, comprise a signal indicative of the composite signal spectrally shifted to an RF frequency.</p> <p>FIG. 2 shows an exemplary frequency spectrum 241 associated with the RF signal formed by the upconverter 240. The frequency spectrum 241 comprises a first portion 243 corresponding to the first signal component and a second portion 242 corresponding to the second signal component. Note that the first portion 243 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 242. Also note that the first portion 243 and</p>

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	<p>second portion 242 might be formed with a first mirror portion 244 and second mirror portion 245, respectively. Note that a mirror portion may either be removed or may be kept for later processing. The exemplary communication system 200 may further comprise a RF transmission stage 250 adapted to transmit an RF signal. The RF transmission stage 250 may, for example and without limitation, share any or all characteristics with the RF transmission stage 150 discussed previously. Such an RF signal may, for example, be associated with the composite signal output from the signal combiner 230 and upconverted by the upconverter 240. The RF transmission stage 250 may, for example and without limitation, comprise a power amplifier 252, antenna 254 and other components generally associated with RF signal transmission.</p> <p><i>See, e.g., Rofougaran at 6:66-7:57.</i></p> <p>For example, the spectral placement module 510, optional second spectral placement module 520 and signal combiner 530 may operate in the analog domain. The first digital-to-analog converter 592 may convert the first baseband signal to the analog domain for processing by the spectral placement module 510. The second digital-to-analog converter 594 may convert the second baseband signal to the analog domain for processing by the second spectral placement module 520 or signal combiner 530. The signal combiner 530 then combines signals in the analog domain to generate an analog composite signal, which is then upconverted and transmitted by the upconverter 540 and RF transmission stage 550, respectively.</p> <p><i>See, e.g., Rofougaran at 9:30-41.</i></p> <p>FIG. 7 is a diagram showing a portion of a seventh non-limiting exemplary communication system 700, in accordance with various aspects of the present invention. The exemplary communication system 700 may, for example and without limitation, share any or all characteristics with the exemplary systems 100-600 illustrated in FIGS. 1-6 and discussed previously.</p> <p>The exemplary communication system 700 may comprise a first mixer 744 that receives a spectrally shifted first baseband signal from the spectral placement module 710 and a first RF mixing signal (e.g., a 2.446 GHz signal generally associated with the Bluetooth communication protocol) from a</p>

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	<p>first local oscillator 742. The exemplary communication system 700 may also comprise a second mixer 748 that receives a second baseband signal (or a spectrally shifted second baseband signal) and a second RF mixing signal (e.g., a 2.486 GHz signal generally associated with the IEEE 802.11(g) communication protocol) from a second local oscillator 746.</p> <p>The exemplary communication system 700 may comprise an RF signal combiner 730 that is adapted to combine input RF signals. The RF signal combiner 730 may, for example, receive and combine the output signals from the first mixer 744 and second mixer 748 to generate an RF composite signal. The exemplary communication system 700 may also comprise a RF transmission stage 750 that receives the RF composite signal from the RF signal combiner 730 and transmit the signal.</p> <p><i>See, e.g., Rofougaran at 10:18-43.</i></p> <p>The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 810 comprises receiving the first baseband signal, step 810 may comprise receiving the first baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The first baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 810 may, for example, comprise generating the first baseband signal independently (e.g., corresponding to an independent communication). Step 810 may alternatively, for example, comprise generating the first baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first baseband signal and other baseband signals for a single communication).</p> <p>The exemplary method 800 may, at step 820, comprise spectrally placing (or shifting) the first baseband signal (e.g., received at step 810). Step 820 may, for example and without limitation, share any or all functional characteristics with the spectral placement modules 110-710 of the exemplary systems 100-700 illustrated in FIGS. 1-7 and discussed previously.</p>

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	<p>Step 820 may, for example, comprise spectrally shifting the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with a second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, step 820 may comprise implementing a frequency-hopping scheme with the first baseband signal. For example, in a scenario where there are one or more frequency bands (e.g., a second frequency space) associated with a second baseband signal, step 820 may comprise spectrally shifting the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p>In another non-limiting exemplary scenario, spectrally shifting the first baseband signal may result in the production of a spectral image (e.g., frequency content mirrored about a mixing frequency utilized to spectrally shift the first baseband signal). In such a scenario, step 820 may comprise accepting or rejecting the image.</p> <p>In a scenario where an image is rejected, step 820 may comprise rejecting the image in any of a variety of manners. For example and without limitation, step 820 may comprise performing image reject mixing to spectrally shift the first baseband signal. Such image reject mixing generally comprises spectrally shifting a signal and rejecting an image associated with the spectrally shifted signal. Also for example, step 820 may comprise filtering out an unwanted image. The scope of various aspects of the present invention should not be limited by the utilization of image rejection or by any particular manner of performing such image rejection.</p> <p>The exemplary method 800 may, at step 830, comprise generating and/or receiving a second baseband signal corresponding to a second communication protocol (e.g., different from the first communication protocol). Step 830 may, for example and without limitation, share any or all functional characteristics with the second input 102 of the exemplary system 100 illustrated in FIG. 1 and discussed previously.</p>

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	<p>The second baseband signal may, for example, correspond to a second communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 830 comprises receiving the second baseband signal, step 830 may comprise receiving the second baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 830 may, for example, comprise generating the second baseband signal independently (e.g., corresponding to a communication independent of a communication associated with the first baseband signal). Step 830 may alternatively, for example, comprise generating the second baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the second baseband signal and the first baseband signal for a single communication).</p> <p><i>See, e.g., Rofougaran at 11:53-13:4.</i></p> <p>Furthermore, this claim element is obvious in light of Rofougaran itself, when combined with any of the other references as charted for this claim element in Exs. A-1–A-31, First Supplemental Ex. A-Obviousness Chart, and/or when combined with the knowledge of one of ordinary skill in the art. Motivations to combine may come from the knowledge of the person of ordinary skill themselves, or from the known problems and predictable solutions as embodied in these references. Further motivations to combine references and additional details may be found in the Cover Pleading and First Supplemental Ex. A-Obviousness Chart.</p>

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[23.1] The communication system of claim 17	Rofougaran discloses all the elements of claim 17 for all the reasons provided above.
[23.2] wherein first and second data to be transmitted comprise a plurality of OFDM	Rofougaran discloses “wherein first and second data to be transmitted comprise a plurality of OFDM symbols, wherein a first symbol is transmitted during a first time slot across the first up-converted frequency range and a second symbol is transmitted during the first time slot across the second up-

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symbols, wherein a first symbol is transmitted during a first time slot across the first up-converted frequency range and a second symbol is transmitted during the first time slot across the second up-converted frequency range, and wherein a third symbol is transmitted during a second time slot across the first up-converted frequency range and a fourth symbol is transmitted during the second time slot across a second up-converted frequency range.	<p>converted frequency range, and wherein a third symbol is transmitted during a second time slot across the first up-converted frequency range and a fourth symbol is transmitted during the second time slot across a second up-converted frequency range.” See, e.g.: FIG. 1 is a diagram showing a portion of a first non-limiting exemplary communication system 100, in accordance with various aspects of the present invention. The communication system (or device) may comprise characteristics of any of a variety of communication systems/devices (e.g., multimode wireless communication devices). For example and without limitation, the communication system may comprise characteristics of any of a variety of mobile wireless communication devices (e.g., cellular phones, paging devices, portable email devices, etc.). Also for example, the communication system may comprise characteristics of fixed communication systems or devices (e.g., network access points, base stations, satellites, wireless routers, set top boxes, etc.). Further for example, the communication system may comprise characteristics of a variety of electronic devices with wireless communication capability (e.g., televisions, music players, cameras, remote controls, personal digital assistants, handheld computers, gaming devices, etc.). Accordingly, the scope of various aspects of the present invention should not be limited by characteristics of particular communication systems or devices.</p> <p>The following discussion will, at times, refer to various communication modes. A multimode communication device may, for example, be adapted to communicate in a plurality of such communication modes. For the following discussion, a communication mode may generally be considered to coincide with communication utilizing a particular communication protocol or standard. A non-limiting list of exemplary communication protocols includes various cellular communication protocols (e.g., GSM, GPRS, EDGE, CDMA, WCDMA, TDMA, PDC, etc.), various wireless networking protocols or standards, including WLAN, WMAN, WPAN and WWAN (e.g., IEEE 802.11, Bluetooth, IEEE 802.15, UWB, IEEE 802.16, IEEE 802.20, Zigbee, any WiFi protocol, etc.), various television communication standards, etc. The scope of various aspects of the present invention should not be limited by characteristics of particular communication modes or protocols, whether standard or proprietary.</p>

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	<p>The exemplary communication system 100 may comprise at least a first input 101 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to any of the previously mentioned communication protocols.</p> <p>The exemplary communication system 100 may also comprise at least a second input 102 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first communication protocol discussed above). For example and without limitation, the second baseband signal may correspond to any of the previously mentioned communication protocols.</p> <p>The first baseband signal and the second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of the communication system 100. For example, such modules may generate the first and second baseband signals independently (e.g., corresponding to independent respective communications). Alternatively, for example, such modules may generate the first and second baseband signals in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first and second baseband signals for a single communication).</p> <p>The exemplary communication system 100 may additionally comprise a spectral placement module 110 that is adapted to spectrally shift the first baseband signal (i.e., shift the frequency spectrum of the first baseband signal). In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to spectrally shift the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with the second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to implement a frequency-hopping scheme with the first baseband signal. For example, in a scenario,</p>

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	<p>where there are one or more frequency bands (e.g., a second frequency space) associated with the second baseband signal, the spectral placement module 110 may be adapted to shift the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p><i>See, e.g., Rofougaran at 2:38-3:58.</i></p> <p>The exemplary communication system 100 may also comprise a second spectral placement module 120. Such a second spectral placement module 120 may, for example, share any or all characteristics with the spectral placement module 110 discussed previously. The incorporation of such a second spectral placement module 120 may, for example, provide spectral shifting flexibility. For example, in such an exemplary configuration, either or both of the first and second baseband signals may be spectrally shifted to substantially distinct frequency spaces. Also for example, in such an exemplary configuration, either or both of the first and second baseband signals may be frequency hopped. Note that though the second spectral placement module 120 is illustrated separate from the first spectral placement module 110, the second spectral placement module 120 may share any or all hardware and/or software components with the spectral placement module 110.</p> <p>The exemplary communication system 100 may further comprise a signal combiner 130 that is adapted to generate a composite signal comprising various input signals to the signal combiner 130. For example, the composite signal may simultaneously (i.e., at an instant in time) comprise components associated with various input signals. Note that such simultaneity need not always be present. For example, at a first instant in time, the signal output from the signal combiner 130 might comprise a plurality of components associated with a plurality of respective input signals, at a second instant in time, the signal output from the signal combiner 130 might comprise a single component associated with a single respective input signal, and at a third instant in time, the signal output from the signal combiner 130 might comprise no components.</p> <p>In a first non-limiting exemplary scenario, the signal combiner 130 may receive a first signal that is based on the first baseband signal (e.g., associated with a first communication protocol). Also, the signal combiner 130 may receive a second signal that is based on the second baseband signal (e.g.,</p>

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	<p>associated with a second communication protocol). In such a scenario, the signal combiner 130 may combine the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the first baseband signal and a second signal component based on the second baseband signal. In such a scenario, for example where the frequency spectra of the first and second baseband signals do not overlap, the first and second baseband signals might not be spectrally shifted prior to combining by the signal combiner 130. In such a scenario, the spectral placement module 110 (and optionally, the second spectral placement module 120) may receive a control signal indicating whether or not to perform spectral shifting and/or to what degree spectral shifting should be implemented.</p> <p><i>See, e.g., Rofougaran at 4:16-67.</i></p> <p>Various components of the exemplary communication system 100 (and other communication systems illustrated and discussed herein) may be implemented in analog and/or digital circuitry. To illustrate this, the exemplary communication system 100 is not shown with analog-to-digital converters (ADCs) or digital-to-analog converters (DACs). FIGS. 4-6, to be discussed later, show various non-limiting exemplary configurations including such converters.</p> <p>FIG. 2 is a diagram showing a portion of a second non-limiting exemplary communication system 200, in accordance with various aspects of the present invention. The communication system 200 may, for example and without limitation, share any or all characteristics with the communication system 100 illustrated in FIG. 1 and discussed previously.</p> <p>The exemplary communication system 200 may comprise at least a first input 201 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to the Bluetooth communication protocol. FIG. 2 shows an exemplary frequency spectrum 203 associated with the first baseband signal.</p>

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	<p>The exemplary communication system 200 may also comprise at least a second input 202 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first communication protocol discussed above). For example and without limitation, the first baseband signal may correspond to an IEEE 802.11 communication protocol (e.g., IEEE 802.11(b) or IEEE 802.11(g)). FIG. 2 shows an exemplary frequency spectrum 204 associated with the second baseband signal.</p> <p><i>See, e.g., Rofougaran at 5:64-6:31.</i></p> <p>In a non-limiting exemplary configuration illustrated in FIG. 2, the signal combiner 230 receives a first signal from the spectral placement module 210 that is based on the spectrally shifted first baseband signal. Also, the signal combiner 230 receives a second signal that is based on the second baseband signal. In such a configuration, the signal combiner 230 combines the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the spectrally shifted first baseband signal and a second signal component based on the second baseband signal (e.g., not spectrally shifted).</p> <p>FIG. 2 shows an exemplary frequency spectrum 231 associated with the composite signal formed by the signal combiner 230. The spectrum 231 comprises a first portion 233 corresponding to the first signal component, and a second portion 232 corresponding to the second signal component. Note that the first portion 233 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 232.</p> <p>The exemplary communication system 200 may also comprise an upconverter 240 adapted to upconvert a signal (e.g., the composite signal from the signal combiner 230) for transmission. The upconverter 240 may, for example and without limitation, share any or all characteristics with the upconverter 140 discussed previously.</p> <p>The upconverter 240 may, for example, comprise a mixer 247, a local oscillator 246 and one or more filters 248. The mixer 247 may, for example, receive the composite signal from the signal combiner</p>

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	<p>230 and an RF mixing signal at frequency fRF from a local oscillator 246. The upconverter 240 may, for example, filter the upconverted signal from the mixer 247 with one or more filters 248. The output of the upconverter 240 may, for example, comprise a signal indicative of the composite signal spectrally shifted to an RF frequency.</p> <p>FIG. 2 shows an exemplary frequency spectrum 241 associated with the RF signal formed by the upconverter 240. The frequency spectrum 241 comprises a first portion 243 corresponding to the first signal component and a second portion 242 corresponding to the second signal component. Note that the first portion 243 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 242. Also note that the first portion 243 and second portion 242 might be formed with a first mirror portion 244 and second mirror portion 245, respectively. Note that a mirror portion may either be removed or may be kept for later processing. The exemplary communication system 200 may further comprise a RF transmission stage 250 adapted to transmit an RF signal. The RF transmission stage 250 may, for example and without limitation, share any or all characteristics with the RF transmission stage 150 discussed previously. Such an RF signal may, for example, be associated with the composite signal output from the signal combiner 230 and upconverted by the upconverter 240. The RF transmission stage 250 may, for example and without limitation, comprise a power amplifier 252, antenna 254 and other components generally associated with RF signal transmission.</p> <p><i>See, e.g., Rofougaran at 6:66-7:57.</i></p> <p>For example, the spectral placement module 510, optional second spectral placement module 520 and signal combiner 530 may operate in the analog domain. The first digital-to-analog converter 592 may convert the first baseband signal to the analog domain for processing by the spectral placement module 510. The second digital-to-analog converter 594 may convert the second baseband signal to the analog domain for processing by the second spectral placement module 520 or signal combiner 530. The signal combiner 530 then combines signals in the analog domain to generate an analog composite signal, which is then upconverted and transmitted by the upconverter 540 and RF transmission stage 550, respectively.</p>

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	<p><i>See, e.g.</i>, Rofougaran at 9:30-41.</p> <p>FIG. 7 is a diagram showing a portion of a seventh non-limiting exemplary communication system 700, in accordance with various aspects of the present invention. The exemplary communication system 700 may, for example and without limitation, share any or all characteristics with the exemplary systems 100-600 illustrated in FIGS. 1-6 and discussed previously.</p> <p>The exemplary communication system 700 may comprise a first mixer 744 that receives a spectrally shifted first baseband signal from the spectral placement module 710 and a first RF mixing signal (e.g., a 2.446 GHz signal generally associated with the Bluetooth communication protocol) from a first local oscillator 742. The exemplary communication system 700 may also comprise a second mixer 748 that receives a second baseband signal (or a spectrally shifted second baseband signal) and a second RF mixing signal (e.g., a 2.486 GHz signal generally associated with the IEEE 802.11(g) communication protocol) from a second local oscillator 746.</p> <p>The exemplary communication system 700 may comprise an RF signal combiner 730 that is adapted to combine input RF signals. The RF signal combiner 730 may, for example, receive and combine the output signals from the first mixer 744 and second mixer 748 to generate an RF composite signal. The exemplary communication system 700 may also comprise a RF transmission stage 750 that receives the RF composite signal from the RF signal combiner 730 and transmit the signal.</p> <p><i>See, e.g.</i>, Rofougaran at 10:18-43.</p> <p>The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 810 comprises receiving the first baseband signal, step 810 may comprise receiving the first baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The first baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 810 may, for example, comprise generating the first baseband signal independently (e.g.,</p>

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	<p>corresponding to an independent communication). Step 810 may alternatively, for example, comprise generating the first baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first baseband signal and other baseband signals for a single communication).</p> <p>The exemplary method 800 may, at step 820, comprise spectrally placing (or shifting) the first baseband signal (e.g., received at step 810). Step 820 may, for example and without limitation, share any or all functional characteristics with the spectral placement modules 110-710 of the exemplary systems 100-700 illustrated in FIGS. 1-7 and discussed previously.</p> <p>Step 820 may, for example, comprise spectrally shifting the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with a second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, step 820 may comprise implementing a frequency-hopping scheme with the first baseband signal. For example, in a scenario where there are one or more frequency bands (e.g., a second frequency space) associated with a second baseband signal, step 820 may comprise spectrally shifting the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p>In another non-limiting exemplary scenario, spectrally shifting the first baseband signal may result in the production of a spectral image (e.g., frequency content mirrored about a mixing frequency utilized to spectrally shift the first baseband signal). In such a scenario, step 820 may comprise accepting or rejecting the image.</p> <p>In a scenario where an image is rejected, step 820 may comprise rejecting the image in any of a variety of manners. For example and without limitation, step 820 may comprise performing image reject mixing to spectrally shift the first baseband signal. Such image reject mixing generally</p>

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	<p>comprises spectrally shifting a signal and rejecting an image associated with the spectrally shifted signal. Also for example, step 820 may comprise filtering out an unwanted image. The scope of various aspects of the present invention should not be limited by the utilization of image rejection or by any particular manner of performing such image rejection.</p> <p>The exemplary method 800 may, at step 830, comprise generating and/or receiving a second baseband signal corresponding to a second communication protocol (e.g., different from the first communication protocol). Step 830 may, for example and without limitation, share any or all functional characteristics with the second input 102 of the exemplary system 100 illustrated in FIG. 1 and discussed previously.</p> <p>The second baseband signal may, for example, correspond to a second communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 830 comprises receiving the second baseband signal, step 830 may comprise receiving the second baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 830 may, for example, comprise generating the second baseband signal independently (e.g., corresponding to a communication independent of a communication associated with the first baseband signal). Step 830 may alternatively, for example, comprise generating the second baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the second baseband signal and the first baseband signal for a single communication).</p> <p><i>See, e.g., Rofougaran at 11:53-13:4.</i></p> <p>Furthermore, this claim element is obvious in light of Rofougaran itself, when combined with any of the other references as charted for this claim element in Exs. A-1–A-31, First Supplemental Ex. A–Obviousness Chart, and/or when combined with the knowledge of one of ordinary skill in the art. Motivations to combine may come from the knowledge of the person of ordinary skill themselves, or from the known problems and predictable solutions as embodied in these references. Further</p>

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	motivations to combine references and additional details may be found in the Cover Pleading and First Supplemental Ex. A-Obviousness Chart.

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[24.1] An electronic circuit comprising:	<p>To the extent the preamble is limiting, Rofougaran discloses “An electronic circuit comprising.” See, e.g.:</p> <p>FIG. 1 is a diagram showing a portion of a first non-limiting exemplary communication system 100, in accordance with various aspects of the present invention. The communication system (or device) may comprise characteristics of any of a variety of communication systems/devices (e.g., multimode wireless communication devices). For example and without limitation, the communication system may comprise characteristics of any of a variety of mobile wireless communication devices (e.g., cellular phones, paging devices, portable email devices, etc.). Also for example, the communication system may comprise characteristics of fixed communication systems or devices (e.g., network access points, base stations, satellites, wireless routers, set top boxes, etc.). Further for example, the communication system may comprise characteristics of a variety of electronic devices with wireless communication capability (e.g., televisions, music players, cameras, remote controls, personal digital assistants, handheld computers, gaming devices, etc.). Accordingly, the scope of various aspects of the present invention should not be limited by characteristics of particular communication systems or devices.</p> <p>The following discussion will, at times, refer to various communication modes. A multimode communication device may, for example, be adapted to communicate in a plurality of such communication modes. For the following discussion, a communication mode may generally be considered to coincide with communication utilizing a particular communication protocol or standard. A non-limiting list of exemplary communication protocols includes various cellular communication protocols (e.g., GSM, GPRS, EDGE, CDMA, WCDMA, TDMA, PDC, etc.), various wireless networking protocols or standards, including WLAN, WMAN, WPAN and WWAN (e.g., IEEE 802.11, Bluetooth, IEEE 802.15, UWB, IEEE 802.16, IEEE 802.20, Zigbee, any WiFi protocol,</p>

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	<p>etc.), various television communication standards, etc. The scope of various aspects of the present invention should not be limited by characteristics of particular communication modes or protocols, whether standard or proprietary.</p> <p><i>See, e.g., Rofougaran at 2:36-3:6.</i></p> <p>Figure 2</p> <p><i>See, e.g., Rofougaran at Figure 2.</i></p>

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	<p>Figure 5</p> <p><i>See, e.g., Rofougaran at Figure 5.</i></p>

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	<p>The diagram illustrates a signal processing chain for RF transmission. A 'First Baseband Signal' (700) enters a 'Spectral Placement Module' (710). Simultaneously, a 'Second Baseband Signal' (720) enters an 'Optional Second Spectral Placement Module' (720), which is shown within a dashed box. The output of the first module (710) is combined with the output of the second module (720) via a mixer (744). This intermediate signal is then mixed with a local oscillator signal (LO1, e.g., 2.446 GHz) from block 742 via another mixer (748). The resulting signal is processed by an 'RF Signal Combiner' (730) and then sent to an 'RF Xmit Stage' (750) for final transmission.</p>

Figure 7

See, e.g., Rofougaran at Figure 7.

Furthermore, this claim element is obvious in light of Rofougaran itself, when combined with any of the other references as charted for this claim element in Exs. A-1–A-31, First Supplemental Ex. A–Obviousness Chart, and/or when combined with the knowledge of one of ordinary skill in the art. Motivations to combine may come from the knowledge of the person of ordinary skill themselves, or from the known problems and predictable solutions as embodied in these references. Further

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	motivations to combine references and additional details may be found in the Cover Pleading and First Supplemental Ex. A-Obviousness Chart.
[24.2] a first down-converter circuit having a first input coupled to receive a first up-converted signal, a second input coupled to receive a first demodulation signal having a first RF frequency, and an output, wherein the first down-converter circuit outputs a first down-converted signal on the first down-converter output;	<p>Rofougaran discloses “a first down-converter circuit having a first input coupled to receive a first up-converted signal, a second input coupled to receive a first demodulation signal having a first RF frequency, and an output, wherein the first down-converter circuit outputs a first down-converted signal on the first down-converter output.” See, e.g.:</p> <p>Figure 2</p> <p>See, e.g., Rofougaran at Figure 2.</p>

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	<p>Figure 5</p> <p><i>See, e.g., Rofougaran at Figure 5.</i></p>

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	<p>The diagram illustrates a communication system architecture. A 'First Baseband Signal' (700) enters a 'Spectral Placement Module' (710). An 'Optional Second Spectral Placement Module' (720) receives a 'Second Baseband Signal' (700) and its output is sent to a mixer (748). The output of the 'Spectral Placement Module' (710) is also sent to a mixer (744). Both mixers receive a local oscillator signal: LO1 (e.g., 2.446 GHz) at 742 and LO2 (e.g., 2.486 GHz) at 746. The outputs of the mixers (744 and 748) are combined at a 'RF Signal Combiner' (730). The resulting signal is sent to an 'RF Xmit Stage' (750) for transmission.</p>

Figure 7

See, e.g., Rofougaran at Figure 7.

FIG. 1 is a diagram showing a portion of a first non-limiting exemplary communication system 100, in accordance with various aspects of the present invention. The communication system (or device) may comprise characteristics of any of a variety of communication systems/devices (e.g., multimode wireless communication devices). For example and without limitation, the communication system may comprise characteristics of any of a variety of mobile wireless communication devices (e.g.,

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	<p>cellular phones, paging devices, portable email devices, etc.). Also for example, the communication system may comprise characteristics of fixed communication systems or devices (e.g., network access points, base stations, satellites, wireless routers, set top boxes, etc.). Further for example, the communication system may comprise characteristics of a variety of electronic devices with wireless communication capability (e.g., televisions, music players, cameras, remote controls, personal digital assistants, handheld computers, gaming devices, etc.). Accordingly, the scope of various aspects of the present invention should not be limited by characteristics of particular communication systems or devices.</p> <p>The following discussion will, at times, refer to various communication modes. A multimode communication device may, for example, be adapted to communicate in a plurality of such communication modes. For the following discussion, a communication mode may generally be considered to coincide with communication utilizing a particular communication protocol or standard. A non-limiting list of exemplary communication protocols includes various cellular communication protocols (e.g., GSM, GPRS, EDGE, CDMA, WCDMA, TDMA, PDC, etc.), various wireless networking protocols or standards, including WLAN, WMAN, WPAN and WWAN (e.g., IEEE 802.11, Bluetooth, IEEE 802.15, UWB, IEEE 802.16, IEEE 802.20, Zigbee, any WiFi protocol, etc.), various television communication standards, etc. The scope of various aspects of the present invention should not be limited by characteristics of particular communication modes or protocols, whether standard or proprietary.</p> <p>The exemplary communication system 100 may comprise at least a first input 101 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to any of the previously mentioned communication protocols.</p> <p>The exemplary communication system 100 may also comprise at least a second input 102 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first</p>

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	<p>communication protocol discussed above). For example and without limitation, the second baseband signal may correspond to any of the previously mentioned communication protocols. The first baseband signal and the second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of the communication system 100. For example, such modules may generate the first and second baseband signals independently (e.g., corresponding to independent respective communications). Alternatively, for example, such modules may generate the first and second baseband signals in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first and second baseband signals for a single communication).</p> <p>The exemplary communication system 100 may additionally comprise a spectral placement module 110 that is adapted to spectrally shift the first baseband signal (i.e., shift the frequency spectrum of the first baseband signal). In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to spectrally shift the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with the second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to implement a frequency-hopping scheme with the first baseband signal. For example, in a scenario, where there are one or more frequency bands (e.g., a second frequency space) associated with the second baseband signal, the spectral placement module 110 may be adapted to shift the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p><i>See, e.g., Rofougaran at 2:38-3:58.</i></p> <p>The exemplary communication system 100 may also comprise a second spectral placement module 120. Such a second spectral placement module 120 may, for example, share any or all characteristics</p>

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	<p>with the spectral placement module 110 discussed previously. The incorporation of such a second spectral placement module 120 may, for example, provide spectral shifting flexibility. For example, in such an exemplary configuration, either or both of the first and second baseband signals may be spectrally shifted to substantially distinct frequency spaces. Also for example, in such an exemplary configuration, either or both of the first and second baseband signals may be frequency hopped. Note that though the second spectral placement module 120 is illustrated separate from the first spectral placement module 110, the second spectral placement module 120 may share any or all hardware and/or software components with the spectral placement module 110.</p> <p>The exemplary communication system 100 may further comprise a signal combiner 130 that is adapted to generate a composite signal comprising various input signals to the signal combiner 130. For example, the composite signal may simultaneously (i.e., at an instant in time) comprise components associated with various input signals. Note that such simultaneity need not always be present. For example, at a first instant in time, the signal output from the signal combiner 130 might comprise a plurality of components associated with a plurality of respective input signals, at a second instant in time, the signal output from the signal combiner 130 might comprise a single component associated with a single respective input signal, and at a third instant in time, the signal output from the signal combiner 130 might comprise no components.</p> <p>In a first non-limiting exemplary scenario, the signal combiner 130 may receive a first signal that is based on the first baseband signal (e.g., associated with a first communication protocol). Also, the signal combiner 130 may receive a second signal that is based on the second baseband signal (e.g., associated with a second communication protocol). In such a scenario, the signal combiner 130 may combine the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the first baseband signal and a second signal component based on the second baseband signal. In such a scenario, for example where the frequency spectra of the first and second baseband signals do not overlap, the first and second baseband signals might not be spectrally shifted prior to combining by the signal combiner 130. In such a scenario, the spectral placement module 110 (and optionally, the second spectral placement module 120) may receive a control signal indicating whether or not to perform spectral shifting and/or to what degree spectral shifting should be implemented.</p>

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	<p><i>See, e.g.</i>, Rofougaran at 4:16-67.</p> <p>Various components of the exemplary communication system 100 (and other communication systems illustrated and discussed herein) may be implemented in analog and/or digital circuitry. To illustrate this, the exemplary communication system 100 is not shown with analog-to-digital converters (ADCs) or digital-to-analog converters (DACs). FIGS. 4-6, to be discussed later, show various non-limiting exemplary configurations including such converters.</p> <p>FIG. 2 is a diagram showing a portion of a second non-limiting exemplary communication system 200, in accordance with various aspects of the present invention. The communication system 200 may, for example and without limitation, share any or all characteristics with the communication system 100 illustrated in FIG. 1 and discussed previously.</p> <p>The exemplary communication system 200 may comprise at least a first input 201 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to the Bluetooth communication protocol. FIG. 2 shows an exemplary frequency spectrum 203 associated with the first baseband signal.</p> <p>The exemplary communication system 200 may also comprise at least a second input 202 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first communication protocol discussed above). For example and without limitation, the first baseband signal may correspond to an IEEE 802.11 communication protocol (e.g., IEEE 802.11(b) or IEEE 802.11(g)). FIG. 2 shows an exemplary frequency spectrum 204 associated with the second baseband signal.</p> <p><i>See, e.g.</i>, Rofougaran at 5:64-6:31.</p>

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	<p>In a non-limiting exemplary configuration illustrated in FIG. 2, the signal combiner 230 receives a first signal from the spectral placement module 210 that is based on the spectrally shifted first baseband signal. Also, the signal combiner 230 receives a second signal that is based on the second baseband signal. In such a configuration, the signal combiner 230 combines the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the spectrally shifted first baseband signal and a second signal component based on the second baseband signal (e.g., not spectrally shifted).</p> <p>FIG. 2 shows an exemplary frequency spectrum 231 associated with the composite signal formed by the signal combiner 230. The spectrum 231 comprises a first portion 233 corresponding to the first signal component, and a second portion 232 corresponding to the second signal component. Note that the first portion 233 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 232.</p> <p>The exemplary communication system 200 may also comprise an upconverter 240 adapted to upconvert a signal (e.g., the composite signal from the signal combiner 230) for transmission. The upconverter 240 may, for example and without limitation, share any or all characteristics with the upconverter 140 discussed previously.</p> <p>The upconverter 240 may, for example, comprise a mixer 247, a local oscillator 246 and one or more filters 248. The mixer 247 may, for example, receive the composite signal from the signal combiner 230 and an RF mixing signal at frequency fRF from a local oscillator 246. The upconverter 240 may, for example, filter the upconverted signal from the mixer 247 with one or more filters 248. The output of the upconverter 240 may, for example, comprise a signal indicative of the composite signal spectrally shifted to an RF frequency.</p> <p>FIG. 2 shows an exemplary frequency spectrum 241 associated with the RF signal formed by the upconverter 240. The frequency spectrum 241 comprises a first portion 243 corresponding to the first signal component and a second portion 242 corresponding to the second signal component. Note that the first portion 243 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 242. Also note that the first portion 243 and</p>

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	<p>second portion 242 might be formed with a first mirror portion 244 and second mirror portion 245, respectively. Note that a mirror portion may either be removed or may be kept for later processing. The exemplary communication system 200 may further comprise a RF transmission stage 250 adapted to transmit an RF signal. The RF transmission stage 250 may, for example and without limitation, share any or all characteristics with the RF transmission stage 150 discussed previously. Such an RF signal may, for example, be associated with the composite signal output from the signal combiner 230 and upconverted by the upconverter 240. The RF transmission stage 250 may, for example and without limitation, comprise a power amplifier 252, antenna 254 and other components generally associated with RF signal transmission.</p> <p><i>See, e.g., Rofougaran at 6:66-7:57.</i></p> <p>For example, the spectral placement module 510, optional second spectral placement module 520 and signal combiner 530 may operate in the analog domain. The first digital-to-analog converter 592 may convert the first baseband signal to the analog domain for processing by the spectral placement module 510. The second digital-to-analog converter 594 may convert the second baseband signal to the analog domain for processing by the second spectral placement module 520 or signal combiner 530. The signal combiner 530 then combines signals in the analog domain to generate an analog composite signal, which is then upconverted and transmitted by the upconverter 540 and RF transmission stage 550, respectively.</p> <p><i>See, e.g., Rofougaran at 9:30-41.</i></p> <p>FIG. 7 is a diagram showing a portion of a seventh non-limiting exemplary communication system 700, in accordance with various aspects of the present invention. The exemplary communication system 700 may, for example and without limitation, share any or all characteristics with the exemplary systems 100-600 illustrated in FIGS. 1-6 and discussed previously.</p> <p>The exemplary communication system 700 may comprise a first mixer 744 that receives a spectrally shifted first baseband signal from the spectral placement module 710 and a first RF mixing signal (e.g., a 2.446 GHz signal generally associated with the Bluetooth communication protocol) from a</p>

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	<p>first local oscillator 742. The exemplary communication system 700 may also comprise a second mixer 748 that receives a second baseband signal (or a spectrally shifted second baseband signal) and a second RF mixing signal (e.g., a 2.486 GHz signal generally associated with the IEEE 802.11(g) communication protocol) from a second local oscillator 746.</p> <p>The exemplary communication system 700 may comprise an RF signal combiner 730 that is adapted to combine input RF signals. The RF signal combiner 730 may, for example, receive and combine the output signals from the first mixer 744 and second mixer 748 to generate an RF composite signal. The exemplary communication system 700 may also comprise a RF transmission stage 750 that receives the RF composite signal from the RF signal combiner 730 and transmit the signal.</p> <p><i>See, e.g., Rofougaran at 10:18-43.</i></p> <p>The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 810 comprises receiving the first baseband signal, step 810 may comprise receiving the first baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The first baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 810 may, for example, comprise generating the first baseband signal independently (e.g., corresponding to an independent communication). Step 810 may alternatively, for example, comprise generating the first baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first baseband signal and other baseband signals for a single communication).</p> <p>The exemplary method 800 may, at step 820, comprise spectrally placing (or shifting) the first baseband signal (e.g., received at step 810). Step 820 may, for example and without limitation, share any or all functional characteristics with the spectral placement modules 110-710 of the exemplary systems 100-700 illustrated in FIGS. 1-7 and discussed previously.</p>

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	<p>Step 820 may, for example, comprise spectrally shifting the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with a second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, step 820 may comprise implementing a frequency-hopping scheme with the first baseband signal. For example, in a scenario where there are one or more frequency bands (e.g., a second frequency space) associated with a second baseband signal, step 820 may comprise spectrally shifting the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p>In another non-limiting exemplary scenario, spectrally shifting the first baseband signal may result in the production of a spectral image (e.g., frequency content mirrored about a mixing frequency utilized to spectrally shift the first baseband signal). In such a scenario, step 820 may comprise accepting or rejecting the image.</p> <p>In a scenario where an image is rejected, step 820 may comprise rejecting the image in any of a variety of manners. For example and without limitation, step 820 may comprise performing image reject mixing to spectrally shift the first baseband signal. Such image reject mixing generally comprises spectrally shifting a signal and rejecting an image associated with the spectrally shifted signal. Also for example, step 820 may comprise filtering out an unwanted image. The scope of various aspects of the present invention should not be limited by the utilization of image rejection or by any particular manner of performing such image rejection.</p> <p>The exemplary method 800 may, at step 830, comprise generating and/or receiving a second baseband signal corresponding to a second communication protocol (e.g., different from the first communication protocol). Step 830 may, for example and without limitation, share any or all functional characteristics with the second input 102 of the exemplary system 100 illustrated in FIG. 1 and discussed previously.</p>

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	<p>The second baseband signal may, for example, correspond to a second communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 830 comprises receiving the second baseband signal, step 830 may comprise receiving the second baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 830 may, for example, comprise generating the second baseband signal independently (e.g., corresponding to a communication independent of a communication associated with the first baseband signal). Step 830 may alternatively, for example, comprise generating the second baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the second baseband signal and the first baseband signal for a single communication).</p> <p><i>See, e.g., Rofougaran at 11:53-13:4.</i></p> <p>Furthermore, this claim element is obvious in light of Rofougaran itself, when combined with any of the other references as charted for this claim element in Exs. A-1–A-31, First Supplemental Ex. A-Obviousness Chart, and/or when combined with the knowledge of one of ordinary skill in the art. Motivations to combine may come from the knowledge of the person of ordinary skill themselves, or from the known problems and predictable solutions as embodied in these references. Further motivations to combine references and additional details may be found in the Cover Pleading and First Supplemental Ex. A-Obviousness Chart.</p>
[24.3] a second down-converter circuit having a first input coupled to receive the first up-converted signal, a second input coupled to receive a second demodulation signal having a second RF frequency different	Rofougaran discloses “a second down-converter circuit having a first input coupled to receive the first up-converted signal, a second input coupled to receive a second demodulation signal having a second RF frequency different than the first RF frequency, and an output, wherein the second down-converter outputs a second down-converted signal on the second down-converter output, wherein the first up-converted signal comprises a first signal modulated at the first RF frequency and a second signal modulated at the second RF frequency.” See, e.g.:

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<p>than the first RF frequency, and an output, wherein the second down-converter outputs a second down-converted signal on the second down-converter output, wherein the first up-converted signal comprises a first signal modulated at the first RF frequency and a second signal modulated at the second RF frequency; and</p>	<p>Figure 2</p> <p>See, e.g., Rofougaran at Figure 2.</p>

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	<p>Figure 5</p> <p><i>See, e.g., Rofougaran at Figure 5.</i></p>

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	<p>The diagram illustrates a communication system architecture. A 'First Baseband Signal' enters a 'Spectral Placement Module' (710). A 'Second Baseband Signal' enters an 'Optional Second Spectral Placement Module' (720). Both modules output signals to mixers. The mixer for the first module receives a local oscillator signal from 'LO1' (e.g., 2.446 GHz) labeled 742. The mixer for the second module receives a local oscillator signal from 'LO2' (e.g., 2.486 GHz) labeled 746. The outputs of the mixers feed into an 'RF Signal Combiner' (730), which then connects to an 'RF Xmit Stage' (750) for transmission.</p>

Figure 7

See, e.g., Rofougaran at Figure 7.

FIG. 1 is a diagram showing a portion of a first non-limiting exemplary communication system 100, in accordance with various aspects of the present invention. The communication system (or device) may comprise characteristics of any of a variety of communication systems/devices (e.g., multimode wireless communication devices). For example and without limitation, the communication system may comprise characteristics of any of a variety of mobile wireless communication devices (e.g.,

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	<p>cellular phones, paging devices, portable email devices, etc.). Also for example, the communication system may comprise characteristics of fixed communication systems or devices (e.g., network access points, base stations, satellites, wireless routers, set top boxes, etc.). Further for example, the communication system may comprise characteristics of a variety of electronic devices with wireless communication capability (e.g., televisions, music players, cameras, remote controls, personal digital assistants, handheld computers, gaming devices, etc.). Accordingly, the scope of various aspects of the present invention should not be limited by characteristics of particular communication systems or devices.</p> <p>The following discussion will, at times, refer to various communication modes. A multimode communication device may, for example, be adapted to communicate in a plurality of such communication modes. For the following discussion, a communication mode may generally be considered to coincide with communication utilizing a particular communication protocol or standard. A non-limiting list of exemplary communication protocols includes various cellular communication protocols (e.g., GSM, GPRS, EDGE, CDMA, WCDMA, TDMA, PDC, etc.), various wireless networking protocols or standards, including WLAN, WMAN, WPAN and WWAN (e.g., IEEE 802.11, Bluetooth, IEEE 802.15, UWB, IEEE 802.16, IEEE 802.20, Zigbee, any WiFi protocol, etc.), various television communication standards, etc. The scope of various aspects of the present invention should not be limited by characteristics of particular communication modes or protocols, whether standard or proprietary.</p> <p>The exemplary communication system 100 may comprise at least a first input 101 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to any of the previously mentioned communication protocols.</p> <p>The exemplary communication system 100 may also comprise at least a second input 102 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first</p>

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	<p>communication protocol discussed above). For example and without limitation, the second baseband signal may correspond to any of the previously mentioned communication protocols. The first baseband signal and the second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of the communication system 100. For example, such modules may generate the first and second baseband signals independently (e.g., corresponding to independent respective communications). Alternatively, for example, such modules may generate the first and second baseband signals in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first and second baseband signals for a single communication).</p> <p>The exemplary communication system 100 may additionally comprise a spectral placement module 110 that is adapted to spectrally shift the first baseband signal (i.e., shift the frequency spectrum of the first baseband signal). In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to spectrally shift the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with the second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to implement a frequency-hopping scheme with the first baseband signal. For example, in a scenario, where there are one or more frequency bands (e.g., a second frequency space) associated with the second baseband signal, the spectral placement module 110 may be adapted to shift the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p><i>See, e.g., Rofougaran at 2:38-3:58.</i></p> <p>The exemplary communication system 100 may also comprise a second spectral placement module 120. Such a second spectral placement module 120 may, for example, share any or all characteristics</p>

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	<p>with the spectral placement module 110 discussed previously. The incorporation of such a second spectral placement module 120 may, for example, provide spectral shifting flexibility. For example, in such an exemplary configuration, either or both of the first and second baseband signals may be spectrally shifted to substantially distinct frequency spaces. Also for example, in such an exemplary configuration, either or both of the first and second baseband signals may be frequency hopped. Note that though the second spectral placement module 120 is illustrated separate from the first spectral placement module 110, the second spectral placement module 120 may share any or all hardware and/or software components with the spectral placement module 110.</p> <p>The exemplary communication system 100 may further comprise a signal combiner 130 that is adapted to generate a composite signal comprising various input signals to the signal combiner 130. For example, the composite signal may simultaneously (i.e., at an instant in time) comprise components associated with various input signals. Note that such simultaneity need not always be present. For example, at a first instant in time, the signal output from the signal combiner 130 might comprise a plurality of components associated with a plurality of respective input signals, at a second instant in time, the signal output from the signal combiner 130 might comprise a single component associated with a single respective input signal, and at a third instant in time, the signal output from the signal combiner 130 might comprise no components.</p> <p>In a first non-limiting exemplary scenario, the signal combiner 130 may receive a first signal that is based on the first baseband signal (e.g., associated with a first communication protocol). Also, the signal combiner 130 may receive a second signal that is based on the second baseband signal (e.g., associated with a second communication protocol). In such a scenario, the signal combiner 130 may combine the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the first baseband signal and a second signal component based on the second baseband signal. In such a scenario, for example where the frequency spectra of the first and second baseband signals do not overlap, the first and second baseband signals might not be spectrally shifted prior to combining by the signal combiner 130. In such a scenario, the spectral placement module 110 (and optionally, the second spectral placement module 120) may receive a control signal indicating whether or not to perform spectral shifting and/or to what degree spectral shifting should be implemented.</p>

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	<p><i>See, e.g.</i>, Rofougaran at 4:16-67.</p> <p>Various components of the exemplary communication system 100 (and other communication systems illustrated and discussed herein) may be implemented in analog and/or digital circuitry. To illustrate this, the exemplary communication system 100 is not shown with analog-to-digital converters (ADCs) or digital-to-analog converters (DACs). FIGS. 4-6, to be discussed later, show various non-limiting exemplary configurations including such converters.</p> <p>FIG. 2 is a diagram showing a portion of a second non-limiting exemplary communication system 200, in accordance with various aspects of the present invention. The communication system 200 may, for example and without limitation, share any or all characteristics with the communication system 100 illustrated in FIG. 1 and discussed previously.</p> <p>The exemplary communication system 200 may comprise at least a first input 201 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to the Bluetooth communication protocol. FIG. 2 shows an exemplary frequency spectrum 203 associated with the first baseband signal.</p> <p>The exemplary communication system 200 may also comprise at least a second input 202 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first communication protocol discussed above). For example and without limitation, the first baseband signal may correspond to an IEEE 802.11 communication protocol (e.g., IEEE 802.11(b) or IEEE 802.11(g)). FIG. 2 shows an exemplary frequency spectrum 204 associated with the second baseband signal.</p> <p><i>See, e.g.</i>, Rofougaran at 5:64-6:31.</p>

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	<p>In a non-limiting exemplary configuration illustrated in FIG. 2, the signal combiner 230 receives a first signal from the spectral placement module 210 that is based on the spectrally shifted first baseband signal. Also, the signal combiner 230 receives a second signal that is based on the second baseband signal. In such a configuration, the signal combiner 230 combines the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the spectrally shifted first baseband signal and a second signal component based on the second baseband signal (e.g., not spectrally shifted).</p> <p>FIG. 2 shows an exemplary frequency spectrum 231 associated with the composite signal formed by the signal combiner 230. The spectrum 231 comprises a first portion 233 corresponding to the first signal component, and a second portion 232 corresponding to the second signal component. Note that the first portion 233 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 232.</p> <p>The exemplary communication system 200 may also comprise an upconverter 240 adapted to upconvert a signal (e.g., the composite signal from the signal combiner 230) for transmission. The upconverter 240 may, for example and without limitation, share any or all characteristics with the upconverter 140 discussed previously.</p> <p>The upconverter 240 may, for example, comprise a mixer 247, a local oscillator 246 and one or more filters 248. The mixer 247 may, for example, receive the composite signal from the signal combiner 230 and an RF mixing signal at frequency fRF from a local oscillator 246. The upconverter 240 may, for example, filter the upconverted signal from the mixer 247 with one or more filters 248. The output of the upconverter 240 may, for example, comprise a signal indicative of the composite signal spectrally shifted to an RF frequency.</p> <p>FIG. 2 shows an exemplary frequency spectrum 241 associated with the RF signal formed by the upconverter 240. The frequency spectrum 241 comprises a first portion 243 corresponding to the first signal component and a second portion 242 corresponding to the second signal component. Note that the first portion 243 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 242. Also note that the first portion 243 and</p>

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	<p>second portion 242 might be formed with a first mirror portion 244 and second mirror portion 245, respectively. Note that a mirror portion may either be removed or may be kept for later processing. The exemplary communication system 200 may further comprise a RF transmission stage 250 adapted to transmit an RF signal. The RF transmission stage 250 may, for example and without limitation, share any or all characteristics with the RF transmission stage 150 discussed previously. Such an RF signal may, for example, be associated with the composite signal output from the signal combiner 230 and upconverted by the upconverter 240. The RF transmission stage 250 may, for example and without limitation, comprise a power amplifier 252, antenna 254 and other components generally associated with RF signal transmission.</p> <p><i>See, e.g., Rofougaran at 6:66-7:57.</i></p> <p>For example, the spectral placement module 510, optional second spectral placement module 520 and signal combiner 530 may operate in the analog domain. The first digital-to-analog converter 592 may convert the first baseband signal to the analog domain for processing by the spectral placement module 510. The second digital-to-analog converter 594 may convert the second baseband signal to the analog domain for processing by the second spectral placement module 520 or signal combiner 530. The signal combiner 530 then combines signals in the analog domain to generate an analog composite signal, which is then upconverted and transmitted by the upconverter 540 and RF transmission stage 550, respectively.</p> <p><i>See, e.g., Rofougaran at 9:30-41.</i></p> <p>FIG. 7 is a diagram showing a portion of a seventh non-limiting exemplary communication system 700, in accordance with various aspects of the present invention. The exemplary communication system 700 may, for example and without limitation, share any or all characteristics with the exemplary systems 100-600 illustrated in FIGS. 1-6 and discussed previously.</p> <p>The exemplary communication system 700 may comprise a first mixer 744 that receives a spectrally shifted first baseband signal from the spectral placement module 710 and a first RF mixing signal (e.g., a 2.446 GHz signal generally associated with the Bluetooth communication protocol) from a</p>

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	<p>first local oscillator 742. The exemplary communication system 700 may also comprise a second mixer 748 that receives a second baseband signal (or a spectrally shifted second baseband signal) and a second RF mixing signal (e.g., a 2.486 GHz signal generally associated with the IEEE 802.11(g) communication protocol) from a second local oscillator 746.</p> <p>The exemplary communication system 700 may comprise an RF signal combiner 730 that is adapted to combine input RF signals. The RF signal combiner 730 may, for example, receive and combine the output signals from the first mixer 744 and second mixer 748 to generate an RF composite signal. The exemplary communication system 700 may also comprise a RF transmission stage 750 that receives the RF composite signal from the RF signal combiner 730 and transmit the signal.</p> <p><i>See, e.g., Rofougaran at 10:18-43.</i></p> <p>The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 810 comprises receiving the first baseband signal, step 810 may comprise receiving the first baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The first baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 810 may, for example, comprise generating the first baseband signal independently (e.g., corresponding to an independent communication). Step 810 may alternatively, for example, comprise generating the first baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first baseband signal and other baseband signals for a single communication).</p> <p>The exemplary method 800 may, at step 820, comprise spectrally placing (or shifting) the first baseband signal (e.g., received at step 810). Step 820 may, for example and without limitation, share any or all functional characteristics with the spectral placement modules 110-710 of the exemplary systems 100-700 illustrated in FIGS. 1-7 and discussed previously.</p>

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	<p>Step 820 may, for example, comprise spectrally shifting the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with a second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, step 820 may comprise implementing a frequency-hopping scheme with the first baseband signal. For example, in a scenario where there are one or more frequency bands (e.g., a second frequency space) associated with a second baseband signal, step 820 may comprise spectrally shifting the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p>In another non-limiting exemplary scenario, spectrally shifting the first baseband signal may result in the production of a spectral image (e.g., frequency content mirrored about a mixing frequency utilized to spectrally shift the first baseband signal). In such a scenario, step 820 may comprise accepting or rejecting the image.</p> <p>In a scenario where an image is rejected, step 820 may comprise rejecting the image in any of a variety of manners. For example and without limitation, step 820 may comprise performing image reject mixing to spectrally shift the first baseband signal. Such image reject mixing generally comprises spectrally shifting a signal and rejecting an image associated with the spectrally shifted signal. Also for example, step 820 may comprise filtering out an unwanted image. The scope of various aspects of the present invention should not be limited by the utilization of image rejection or by any particular manner of performing such image rejection.</p> <p>The exemplary method 800 may, at step 830, comprise generating and/or receiving a second baseband signal corresponding to a second communication protocol (e.g., different from the first communication protocol). Step 830 may, for example and without limitation, share any or all functional characteristics with the second input 102 of the exemplary system 100 illustrated in FIG. 1 and discussed previously.</p>

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	<p>The second baseband signal may, for example, correspond to a second communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 830 comprises receiving the second baseband signal, step 830 may comprise receiving the second baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 830 may, for example, comprise generating the second baseband signal independently (e.g., corresponding to a communication independent of a communication associated with the first baseband signal). Step 830 may alternatively, for example, comprise generating the second baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the second baseband signal and the first baseband signal for a single communication).</p> <p><i>See, e.g., Rofougaran at 11:53-13:4.</i></p> <p>Furthermore, this claim element is obvious in light of Rofougaran itself, when combined with any of the other references as charted for this claim element in Exs. A-1–A-31, First Supplemental Ex. A-Obviousness Chart, and/or when combined with the knowledge of one of ordinary skill in the art. Motivations to combine may come from the knowledge of the person of ordinary skill themselves, or from the known problems and predictable solutions as embodied in these references. Further motivations to combine references and additional details may be found in the Cover Pleading and First Supplemental Ex. A-Obviousness Chart.</p>
[24.4] a filter having an input coupled to the output of the first down-converter and the output of the second down-converter, and in accordance therewith, the filter receives the first and second down-converted signals.	Rofougaran discloses “a filter having an input coupled to the output of the first down-converter and the output of the second down-converter, and in accordance therewith, the filter receives the first and second down-converted signals.” See, e.g.:

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	<p>The diagram illustrates a signal processing system for spectral placement. It starts with two baseband signals: 'First Baseband Signal' (201) and 'Second Baseband Signal' (202), which are fed into a 'Spectral Placement Module' (210). This module outputs signals 211 and 212, which are positioned at frequencies $-f_s$ and f_s relative to a carrier frequency. These signals are combined by a 'Signal Combiner' (230) along with a local oscillator signal (246) from a 'LO' source (246). The resulting signal 247 is then processed by a mixer (247) and a filter (248). Finally, the signal 241 is amplified by a power amplifier (PA) (250) and transmitted through an antenna (252). The entire process is labeled with reference numerals 200, 203, 204, 231, 232, 233, 240, 242, 243, and 244.</p>

Figure 2

See, e.g., Rofougaran at Figure 2.

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	<p>Figure 5</p> <p><i>See, e.g., Rofougaran at Figure 5.</i></p>

Claim 24 of the '802 Patent	Prior Art Reference – Rofougaran
	<p>The diagram illustrates a communication system architecture. It begins with two input signals: a "First Baseband Signal" and a "Second Baseband Signal". The First Baseband Signal is processed by a "Spectral Placement Module" (710). This module is connected to a local oscillator "LO1" (e.g., 2.446 GHz) via a mixer (744). The output of this mixer is then sent to an "RF Signal Combiner" (730). The Second Baseband Signal is processed by an "Optional Second Spectral Placement Module" (720), which is also connected to "LO1" via a mixer (744). Additionally, the Second Baseband Signal is processed by a local oscillator "LO2" (e.g., 2.486 GHz) via a mixer (748). The output of this mixer is then sent to the "RF Signal Combiner" (730). Finally, the combined signal from the "RF Signal Combiner" passes through an "RF Xmit Stage" (750) before being transmitted.</p>

Figure 7

See, e.g., Rofougaran at Figure 7.

FIG. 1 is a diagram showing a portion of a first non-limiting exemplary communication system 100, in accordance with various aspects of the present invention. The communication system (or device) may comprise characteristics of any of a variety of communication systems/devices (e.g., multimode wireless communication devices). For example and without limitation, the communication system may comprise characteristics of any of a variety of mobile wireless communication devices (e.g.,

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	<p>cellular phones, paging devices, portable email devices, etc.). Also for example, the communication system may comprise characteristics of fixed communication systems or devices (e.g., network access points, base stations, satellites, wireless routers, set top boxes, etc.). Further for example, the communication system may comprise characteristics of a variety of electronic devices with wireless communication capability (e.g., televisions, music players, cameras, remote controls, personal digital assistants, handheld computers, gaming devices, etc.). Accordingly, the scope of various aspects of the present invention should not be limited by characteristics of particular communication systems or devices.</p> <p>The following discussion will, at times, refer to various communication modes. A multimode communication device may, for example, be adapted to communicate in a plurality of such communication modes. For the following discussion, a communication mode may generally be considered to coincide with communication utilizing a particular communication protocol or standard. A non-limiting list of exemplary communication protocols includes various cellular communication protocols (e.g., GSM, GPRS, EDGE, CDMA, WCDMA, TDMA, PDC, etc.), various wireless networking protocols or standards, including WLAN, WMAN, WPAN and WWAN (e.g., IEEE 802.11, Bluetooth, IEEE 802.15, UWB, IEEE 802.16, IEEE 802.20, Zigbee, any WiFi protocol, etc.), various television communication standards, etc. The scope of various aspects of the present invention should not be limited by characteristics of particular communication modes or protocols, whether standard or proprietary.</p> <p>The exemplary communication system 100 may comprise at least a first input 101 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to any of the previously mentioned communication protocols.</p> <p>The exemplary communication system 100 may also comprise at least a second input 102 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first</p>

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	<p>communication protocol discussed above). For example and without limitation, the second baseband signal may correspond to any of the previously mentioned communication protocols. The first baseband signal and the second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of the communication system 100. For example, such modules may generate the first and second baseband signals independently (e.g., corresponding to independent respective communications). Alternatively, for example, such modules may generate the first and second baseband signals in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first and second baseband signals for a single communication).</p> <p>The exemplary communication system 100 may additionally comprise a spectral placement module 110 that is adapted to spectrally shift the first baseband signal (i.e., shift the frequency spectrum of the first baseband signal). In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to spectrally shift the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with the second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, the spectral placement module 110 may be adapted to implement a frequency-hopping scheme with the first baseband signal. For example, in a scenario, where there are one or more frequency bands (e.g., a second frequency space) associated with the second baseband signal, the spectral placement module 110 may be adapted to shift the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p><i>See, e.g., Rofougaran at 2:38-3:58.</i></p> <p>The exemplary communication system 100 may also comprise a second spectral placement module 120. Such a second spectral placement module 120 may, for example, share any or all characteristics</p>

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	<p>with the spectral placement module 110 discussed previously. The incorporation of such a second spectral placement module 120 may, for example, provide spectral shifting flexibility. For example, in such an exemplary configuration, either or both of the first and second baseband signals may be spectrally shifted to substantially distinct frequency spaces. Also for example, in such an exemplary configuration, either or both of the first and second baseband signals may be frequency hopped. Note that though the second spectral placement module 120 is illustrated separate from the first spectral placement module 110, the second spectral placement module 120 may share any or all hardware and/or software components with the spectral placement module 110.</p> <p>The exemplary communication system 100 may further comprise a signal combiner 130 that is adapted to generate a composite signal comprising various input signals to the signal combiner 130. For example, the composite signal may simultaneously (i.e., at an instant in time) comprise components associated with various input signals. Note that such simultaneity need not always be present. For example, at a first instant in time, the signal output from the signal combiner 130 might comprise a plurality of components associated with a plurality of respective input signals, at a second instant in time, the signal output from the signal combiner 130 might comprise a single component associated with a single respective input signal, and at a third instant in time, the signal output from the signal combiner 130 might comprise no components.</p> <p>In a first non-limiting exemplary scenario, the signal combiner 130 may receive a first signal that is based on the first baseband signal (e.g., associated with a first communication protocol). Also, the signal combiner 130 may receive a second signal that is based on the second baseband signal (e.g., associated with a second communication protocol). In such a scenario, the signal combiner 130 may combine the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the first baseband signal and a second signal component based on the second baseband signal. In such a scenario, for example where the frequency spectra of the first and second baseband signals do not overlap, the first and second baseband signals might not be spectrally shifted prior to combining by the signal combiner 130. In such a scenario, the spectral placement module 110 (and optionally, the second spectral placement module 120) may receive a control signal indicating whether or not to perform spectral shifting and/or to what degree spectral shifting should be implemented.</p>

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	<p><i>See, e.g.</i>, Rofougaran at 4:16-67.</p> <p>Various components of the exemplary communication system 100 (and other communication systems illustrated and discussed herein) may be implemented in analog and/or digital circuitry. To illustrate this, the exemplary communication system 100 is not shown with analog-to-digital converters (ADCs) or digital-to-analog converters (DACs). FIGS. 4-6, to be discussed later, show various non-limiting exemplary configurations including such converters.</p> <p>FIG. 2 is a diagram showing a portion of a second non-limiting exemplary communication system 200, in accordance with various aspects of the present invention. The communication system 200 may, for example and without limitation, share any or all characteristics with the communication system 100 illustrated in FIG. 1 and discussed previously.</p> <p>The exemplary communication system 200 may comprise at least a first input 201 adapted to receive a first baseband signal. The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). For example and without limitation, the first baseband signal may correspond to the Bluetooth communication protocol. FIG. 2 shows an exemplary frequency spectrum 203 associated with the first baseband signal.</p> <p>The exemplary communication system 200 may also comprise at least a second input 202 adapted to receive a second baseband signal. The second baseband signal may, for example, correspond to a second communication protocol (e.g., a second communication protocol different from the first communication protocol discussed above). For example and without limitation, the first baseband signal may correspond to an IEEE 802.11 communication protocol (e.g., IEEE 802.11(b) or IEEE 802.11(g)). FIG. 2 shows an exemplary frequency spectrum 204 associated with the second baseband signal.</p> <p><i>See, e.g.</i>, Rofougaran at 5:64-6:31.</p>

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	<p>In a non-limiting exemplary configuration illustrated in FIG. 2, the signal combiner 230 receives a first signal from the spectral placement module 210 that is based on the spectrally shifted first baseband signal. Also, the signal combiner 230 receives a second signal that is based on the second baseband signal. In such a configuration, the signal combiner 230 combines the first and second signals to generate a composite signal, where the composite signal simultaneously comprises a first signal component based on the spectrally shifted first baseband signal and a second signal component based on the second baseband signal (e.g., not spectrally shifted).</p> <p>FIG. 2 shows an exemplary frequency spectrum 231 associated with the composite signal formed by the signal combiner 230. The spectrum 231 comprises a first portion 233 corresponding to the first signal component, and a second portion 232 corresponding to the second signal component. Note that the first portion 233 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 232.</p> <p>The exemplary communication system 200 may also comprise an upconverter 240 adapted to upconvert a signal (e.g., the composite signal from the signal combiner 230) for transmission. The upconverter 240 may, for example and without limitation, share any or all characteristics with the upconverter 140 discussed previously.</p> <p>The upconverter 240 may, for example, comprise a mixer 247, a local oscillator 246 and one or more filters 248. The mixer 247 may, for example, receive the composite signal from the signal combiner 230 and an RF mixing signal at frequency fRF from a local oscillator 246. The upconverter 240 may, for example, filter the upconverted signal from the mixer 247 with one or more filters 248. The output of the upconverter 240 may, for example, comprise a signal indicative of the composite signal spectrally shifted to an RF frequency.</p> <p>FIG. 2 shows an exemplary frequency spectrum 241 associated with the RF signal formed by the upconverter 240. The frequency spectrum 241 comprises a first portion 243 corresponding to the first signal component and a second portion 242 corresponding to the second signal component. Note that the first portion 243 occupies a frequency space (e.g., one or more frequency bands) that is distinct from the frequency space occupied by the second portion 242. Also note that the first portion 243 and</p>

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	<p>second portion 242 might be formed with a first mirror portion 244 and second mirror portion 245, respectively. Note that a mirror portion may either be removed or may be kept for later processing. The exemplary communication system 200 may further comprise a RF transmission stage 250 adapted to transmit an RF signal. The RF transmission stage 250 may, for example and without limitation, share any or all characteristics with the RF transmission stage 150 discussed previously. Such an RF signal may, for example, be associated with the composite signal output from the signal combiner 230 and upconverted by the upconverter 240. The RF transmission stage 250 may, for example and without limitation, comprise a power amplifier 252, antenna 254 and other components generally associated with RF signal transmission.</p> <p><i>See, e.g., Rofougaran at 6:66-7:57.</i></p> <p>For example, the spectral placement module 510, optional second spectral placement module 520 and signal combiner 530 may operate in the analog domain. The first digital-to-analog converter 592 may convert the first baseband signal to the analog domain for processing by the spectral placement module 510. The second digital-to-analog converter 594 may convert the second baseband signal to the analog domain for processing by the second spectral placement module 520 or signal combiner 530. The signal combiner 530 then combines signals in the analog domain to generate an analog composite signal, which is then upconverted and transmitted by the upconverter 540 and RF transmission stage 550, respectively.</p> <p><i>See, e.g., Rofougaran at 9:30-41.</i></p> <p>FIG. 7 is a diagram showing a portion of a seventh non-limiting exemplary communication system 700, in accordance with various aspects of the present invention. The exemplary communication system 700 may, for example and without limitation, share any or all characteristics with the exemplary systems 100-600 illustrated in FIGS. 1-6 and discussed previously.</p> <p>The exemplary communication system 700 may comprise a first mixer 744 that receives a spectrally shifted first baseband signal from the spectral placement module 710 and a first RF mixing signal (e.g., a 2.446 GHz signal generally associated with the Bluetooth communication protocol) from a</p>

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	<p>first local oscillator 742. The exemplary communication system 700 may also comprise a second mixer 748 that receives a second baseband signal (or a spectrally shifted second baseband signal) and a second RF mixing signal (e.g., a 2.486 GHz signal generally associated with the IEEE 802.11(g) communication protocol) from a second local oscillator 746.</p> <p>The exemplary communication system 700 may comprise an RF signal combiner 730 that is adapted to combine input RF signals. The RF signal combiner 730 may, for example, receive and combine the output signals from the first mixer 744 and second mixer 748 to generate an RF composite signal. The exemplary communication system 700 may also comprise a RF transmission stage 750 that receives the RF composite signal from the RF signal combiner 730 and transmit the signal.</p> <p><i>See, e.g., Rofougaran at 10:18-43.</i></p> <p>The first baseband signal may, for example, correspond to a first communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 810 comprises receiving the first baseband signal, step 810 may comprise receiving the first baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The first baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 810 may, for example, comprise generating the first baseband signal independently (e.g., corresponding to an independent communication). Step 810 may alternatively, for example, comprise generating the first baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the first baseband signal and other baseband signals for a single communication).</p> <p>The exemplary method 800 may, at step 820, comprise spectrally placing (or shifting) the first baseband signal (e.g., received at step 810). Step 820 may, for example and without limitation, share any or all functional characteristics with the spectral placement modules 110-710 of the exemplary systems 100-700 illustrated in FIGS. 1-7 and discussed previously.</p>

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	<p>Step 820 may, for example, comprise spectrally shifting the first baseband signal by, at least in part, spectrally shifting the first baseband signal to one or more frequency bands that are substantially distinct from one or more frequency bands associated with a second baseband signal. Occupying such substantially distinct frequency bands, the spectrally shifted first baseband signal may, for example, be combined with the second baseband signal for simultaneous transmission with no interference, relatively little interference, or an acceptable level of interference.</p> <p>In a non-limiting exemplary scenario, step 820 may comprise implementing a frequency-hopping scheme with the first baseband signal. For example, in a scenario where there are one or more frequency bands (e.g., a second frequency space) associated with a second baseband signal, step 820 may comprise spectrally shifting the first baseband signal to numerous consecutive frequency spaces (or bands) that are substantially distinct from the second frequency space.</p> <p>In another non-limiting exemplary scenario, spectrally shifting the first baseband signal may result in the production of a spectral image (e.g., frequency content mirrored about a mixing frequency utilized to spectrally shift the first baseband signal). In such a scenario, step 820 may comprise accepting or rejecting the image.</p> <p>In a scenario where an image is rejected, step 820 may comprise rejecting the image in any of a variety of manners. For example and without limitation, step 820 may comprise performing image reject mixing to spectrally shift the first baseband signal. Such image reject mixing generally comprises spectrally shifting a signal and rejecting an image associated with the spectrally shifted signal. Also for example, step 820 may comprise filtering out an unwanted image. The scope of various aspects of the present invention should not be limited by the utilization of image rejection or by any particular manner of performing such image rejection.</p> <p>The exemplary method 800 may, at step 830, comprise generating and/or receiving a second baseband signal corresponding to a second communication protocol (e.g., different from the first communication protocol). Step 830 may, for example and without limitation, share any or all functional characteristics with the second input 102 of the exemplary system 100 illustrated in FIG. 1 and discussed previously.</p>

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	<p>The second baseband signal may, for example, correspond to a second communication protocol (e.g., any of a variety of wireless communication protocols and/or standards). In an exemplary scenario where step 830 comprises receiving the second baseband signal, step 830 may comprise receiving the second baseband signal in any manner generally associated with receiving a baseband signal.</p> <p>The second baseband signal may, for example, be generated by one or more modules (i.e., hardware and/or software modules) of a communication system implementing the exemplary method 800. Step 830 may, for example, comprise generating the second baseband signal independently (e.g., corresponding to a communication independent of a communication associated with the first baseband signal). Step 830 may alternatively, for example, comprise generating the second baseband signal in a dependent manner (e.g., coordinating independent respective communications or utilizing both the second baseband signal and the first baseband signal for a single communication).</p> <p><i>See, e.g., Rofougaran at 11:53-13:4.</i></p> <p>Furthermore, this claim element is obvious in light of Rofougaran itself, when combined with any of the other references as charted for this claim element in Exs. A-1–A-31, First Supplemental Ex. A-Obviousness Chart, and/or when combined with the knowledge of one of ordinary skill in the art. Motivations to combine may come from the knowledge of the person of ordinary skill themselves, or from the known problems and predictable solutions as embodied in these references. Further motivations to combine references and additional details may be found in the Cover Pleading and First Supplemental Ex. A-Obviousness Chart.</p>